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18 *Attorneys for Plaintiff*
19 **UPF INNOVATIONS, LLC**

20 **UNITED STATES DISTRICT COURT**
21 **NORTHERN DISTRICT OF CALIFORNIA**

22 UPF INNOVATIONS, LLC, a Texas limited
23 liability company,

24 Plaintiff,

25 v.

26 RENESAS ELECTRONICS AMERICA
27 INC., a California corporation,

28 Defendant.

Case No. _____

**COMPLAINT FOR PATENT
INFRINGEMENT**

JURY TRIAL DEMANDED

1 Plaintiff UPF Innovations, LLC (“UPF”), by and through its attorneys, brings this action
2 and makes the following allegations of patent infringement relating to U.S. Patent No. RE40,188
3 (“the ‘188 Patent” or “the patent-in-suit”). Defendant Renesas Electronics America Inc.
4 (“Renesas”) infringes the patent-in-suit in violation of the patent laws of the United States of
5 America, 35 U.S.C. § 1 *et seq.*, and UPF seeks compensation for this infringement.

6 **PARTIES**

7 1. Plaintiff UPF Innovations, LLC is a Texas Limited Liability Company with its
8 principal place of business located at 3800 N. Lamar Blvd., Suite 200, Austin, TX, 78756.

9 2. On information and belief, Defendant Renesas Electronics America Inc. is a
10 California corporation with its principal place of business at 1001 Murphy Ranch Road, Milpitas,
11 CA, 95035. Renesas can be served through its registered agent corporation, CT Corporation
12 System, 818 West Seventh Street, Suite 930, Los Angeles, CA 90017.

13 3. On information and belief, Renesas Electronics America Inc. is a wholly owned
14 subsidiary of Renesas Electronics Corporation, a corporation organized and existing under the
15 laws of Japan with its principal place of business at Toyosu Foresia, 3-2-24 Toyosu, Koto-ku,
16 Tokyo 135-0061, Japan.

17 4. On information and belief, Renesas conducts business, including integrated circuit
18 design and sales, at its principal place of business in Milpitas, CA, which is located in the
19 Northern District of California.¹

20 5. On information and belief, Renesas offers infringing products for sale throughout
21 the United States, including in the Northern District of California.

22 **JURISDICTION AND VENUE**

23 6. This action arises under the patent laws of the United States, Title 35 of the United
24 States Code. Accordingly, this Court has exclusive subject matter jurisdiction over this action
25 under 28 U.S.C. §§ 1331 and 1338(a).

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28 ¹ See CALIFORNIA SECRETARY OF STATE WEBPAGE, California Corporate Number:
C3303924, Statement of Information SI-550, Filed Apr. 5, 2018, available at
<https://businesssearch.sos.ca.gov/> (last visited Apr. 19, 2018).

1 7. Upon information and belief, this Court has personal jurisdiction over Renesas in
 2 this action because Renesas has committed acts within the Northern District of California giving
 3 rise to this action and has established minimum contacts with this forum such that the exercise of
 4 jurisdiction over Renesas would not offend traditional notions of fair play and substantial justice.
 5 Renesas, directly and/or through subsidiaries or intermediaries (including distributors, retailers,
 6 and others), has committed and continues to commit acts of infringement in this District by,
 7 among other things, offering to sell and selling products and/or services that infringe the patent-
 8 in-suit. Moreover, Renesas maintains its principal place of business in the United States in
 9 Milpitas, CA²; and is registered to do business in the State of California³.

10 8. Venue is proper in this district under 28 U.S.C. § 1400(b). On information and
 11 belief, Renesas resides in the Northern District of California because California is its state of
 12 incorporation. Further, on information and belief, Renesas has a regular and established place of
 13 business in the Northern District of California, in Milpitas, California, because it maintains its
 14 principle place of business at 1001 Murphy Ranch Road, Milpitas, CA 95035. Consistent with its
 15 physical presence in Milpitas, California, Renesas advertises its presence in the Northern District
 16 of California on its website.⁴ Further, upon information and belief, Renesas has transacted
 17 business in the Northern District of California and has committed acts of direct infringement in
 18 the Northern District of California.

INTRADISTRICT ASSIGNMENT

19
 20 9. Pursuant to Civil L.R. 3-2(c), this case is appropriate for assignment on a district-
 21 wide basis because this is an Intellectual Property Action.

TECHNOLOGY OVERVIEW

22
 23 10. Integrated circuits have become ubiquitous and continue to become smaller, more
 24 powerful, and more complex. Modern integrated circuits, such as processors, systems on a chip
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26
 27 ² See Renesas Electronics America Inc. Global Operations, <https://www.renesas.com/en-us/about/company/profile/global.html> (last visited Apr. 19, 2018).

28 ³ See CALIFORNIA SECRETARY OF STATE WEBPAGE, California Corporate Number: C3303924, Statement of Information SI-550, Filed Apr. 5, 2018, available at <https://businesssearch.sos.ca.gov/> (last visited Apr. 19, 2018).

⁴ See note 2, *supra* (Renesas office located at “1001 Murphy Ranch Road, Milpitas, CA, 95035”).

1 (“SoCs”), digital memory, application-specific integrated circuits (“ASICs”), and field-
2 programmable gate arrays (“FPGAs”), are used in virtually all modern electronic devices.

3 11. Integrated circuits are often manufactured in batch processes intended to make all
4 integrated circuit chips identical, thereby lowering manufacturing costs and improving quality.
5 However, it is useful to be able to distinguish each individual integrated circuit from all others,
6 for example, to track its source of manufacture, or to identify a system employing the integrated
7 circuit, which are both useful strategies for avoiding counterfeiting.

8 12. While it takes incredible ingenuity to design advanced integrated circuits, and the
9 electronic devices that run by them, such circuitry is nevertheless susceptible to counterfeit.

10 13. In general, a counterfeit electronic part is any unlawful or unauthorized
11 reproduction, substitution, or alteration that has been knowingly mismarked, misidentified, or
12 otherwise misrepresented to be an authentic, unmodified electronic part from the original
13 manufacturer or a source with the express written authority of the original manufacturer or
14 current design activity, including an authorized aftermarket manufacturer. Unlawful or
15 unauthorized substitution may include used electronic parts represented as new, or the false
16 identification of grade, serial number, lot number, date code, or performance characteristics.⁵

17 14. Counterfeit electronic parts cost American companies billions of dollars each
18 year.⁶ But the danger of economic harm is not the only risk of counterfeit parts; rather,
19 counterfeit parts also create significant health and safety risks due to their ubiquity in electronic
20 devices of all sorts, including health and safety equipment.

21 15. As a result of the risks posed by counterfeit electronic parts, the U.S. government
22 has enacted many laws to eliminate the introduction of counterfeit parts into the stream of
23 commerce—especially where government contracts are concerned. For example, in 2012 the
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27 ⁵ See, e.g., U.S. Defense Federal Acquisition Regulation 202.101; SAE Int’l AS5553A and AS6081A.

28 ⁶ See, e.g., Matthew R. Shindell et al., The ‘Ticking Time Bomb’ of Counterfeit Electronic Parts, Industry Week (Jul. 22, 2013), <http://www.industryweek.com/procurement/ticking-time-bomb-counterfeit-electronic-parts>.

1 U.S. government enacted laws requiring regulations for contractors on detection and avoidance of
2 the use of counterfeit electronic parts.⁷

3 16. Many technological solutions for preventing and detecting counterfeit parts have
4 been developed, including, for example, integrating RFID tags into electronic parts, creating
5 hardware “fingerprints,” “watermarking” electronic parts, and others. Many of these
6 technologies are referred to as “intrinsic security” measures because they are built into the
7 electronic parts.

8 17. One intrinsic security technique is based on Physical Unclonable Functions
9 (PUFs). PUFs allow an electronic part to be uniquely identified based on the unique properties of
10 its microstructure, which depends on random physical factors introduced during manufacturing.
11 PUFs are extremely useful for electronic devices because they are easy to produce, often
12 requiring no special manufacturing steps, but very difficult if not impossible to duplicate, even if
13 the exact manufacturing process that produced the PUF is known. PUFs are frequently
14 implemented in electronic parts with high security requirements.

15 **OVERVIEW OF U.S. PATENT NO. RE40,188**

16 18. U.S. Patent Application No. 09/251,692 (‘692 Application) was filed on February
17 17, 1999 and subsequently issued as U.S. Patent No. 6,161,213 (‘213 Patent), entitled “System
18 and Method for Providing Integrated Circuit with a Unique Identification,” on December 12,
19 2000.

20 19. On December 12, 2002, the assignee of the ‘213 Patent filed U.S. Patent Reissue
21 Application 10/318,583 (‘583 Application), entitled “System and Method for Providing
22 Integrated Circuit with a Unique Identification,” based on the ‘213 Patent. The ‘583 Application
23 was subsequently reissued as RE40,188 (‘188 Patent) on March 25, 2008. The ‘188 Patent
24 includes 164 claims total, of which 10 are independent claims.

25 20. The ‘188 Patent recognizes that while many methods exist for uniquely
26 identifying an electronic part, those existing methods require special steps during manufacturing

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28 ⁷ See Contractor Counterfeit Electronic Part Detection and Avoidance System, 48 CFR 252.246-7007 (May 2014), available at <https://www.gpo.gov/fdsys/pkg/CFR-2014-title48-vol3/pdf/CFR-2014-title48-vol3-sec252-246-7007.pdf> (last visited April 19, 2018).

1 that add cost and time to the manufacturing process. To solve this problem, the '188 Patent
2 teaches a novel method for reliably and easily identifying and authenticating individual integrated
3 circuits that does not require any additional manufacturing steps or equipment. Ex. 1 ['188
4 Patent] at 2:36-44.

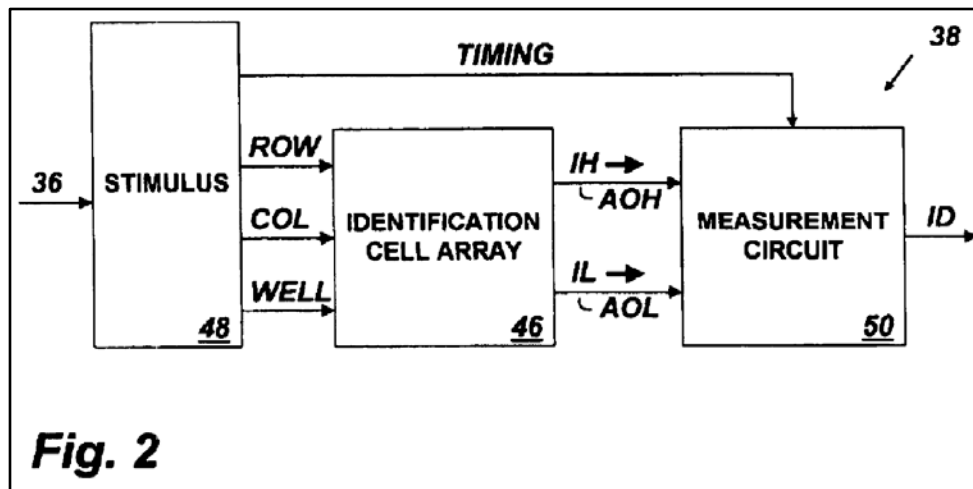
5 21. In particular, the '188 Patent teaches a method of producing integrated circuit
6 identification (ICID) circuits, which produces a unique identification number or record (ID) for
7 each chip in which the ICID is included, even though the ICID circuit is fabricated on all chips
8 using identical masks. Ex. 1 ['188 Patent] at 2:46-50.

9 22. Embodiments of ICID circuits include a set of cells that produce an output ID
10 based on measurements of outputs of those cells, and the outputs of those cells are functions of
11 random parametric variations that naturally occur when fabricating the ICID circuit. Ex. 1 ['188
12 Patent] at 2:50-54. Embodiments of ICID circuits include arrays of cells and a circuit for
13 selecting each cell of the array, measuring that cell's output, and producing the chip ID based on
14 the pattern of measured outputs of all cells in the array. Ex. 1 ['188 Patent] at 2:57-62. The chip
15 ID is thus a unique "fingerprint" for the chip. Ex. 1 ['188 Patent] at 3:1-4.

16 23. The '188 Patent teaches that when the number of ICID circuit cells is sufficiently
17 large, then millions of chips can be provided with a unique identifying ID without having to
18 customize each chip using costly and time-consuming additional processing steps during or after
19 chip fabrication. Ex. 1 ['188 Patent] at 2:54-56; 3:13:17.

20 24. Figure 2 of the '188 Patent depicts a functional block diagram of an embodiment
21 of an ICID device:

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**Fig. 2**

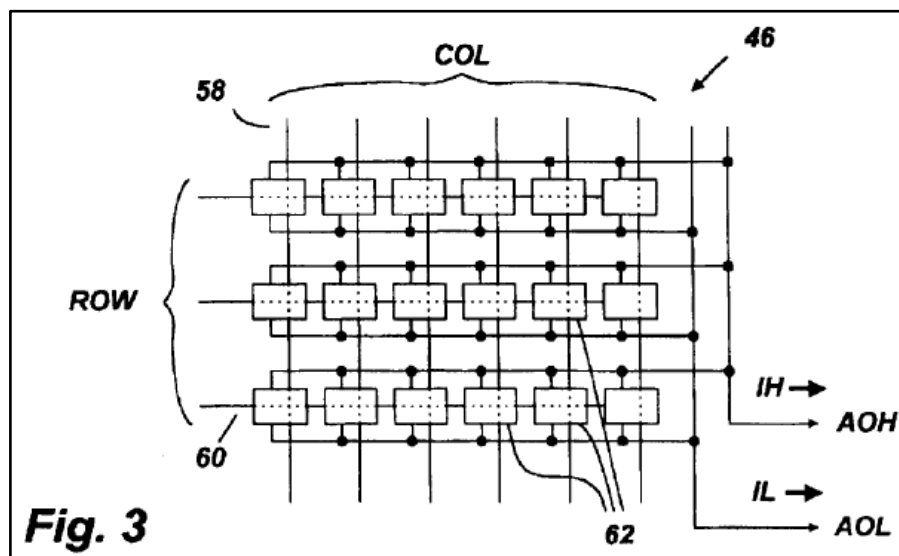
Ex. 1 ['188 Patent] at Fig. 2.

25. Referring to Figure 2, the specification explains: “ICID circuit 38 includes an array 46 of rows and columns of cells. Each cell of array 46, when selected produces a pair of output currents IH and IL on array output lines AOH and AOL. The IH and IL currents are produced by similar transistors within the selected cell and are nearly equal. But due to differences in the transistors resulting from random parametric variations, the IH and IL currents will not exactly match. The difference between the IH and IL currents will vary from cell to cell. A stimulus circuit 48 responds to the control input 36 by supplying row select data (ROW) and a column select data (COL) to array 46 to individually select and stimulate each of its cells in turn. As it selects a cell, stimulus circuit 48 sends timing signals (TIMING) to a measurement circuit 50 telling it when to measure a difference between the currents IH and IL of the selected cell.”

Ex. 1 ['188 Patent] at 5:22-37.

26. The specification further explains that: “[m]easurement circuit 50, sequenced by TIMING strob[es] from stimulus circuit 48, measures the current difference between IH and IL for each cell and ... produces a serial output ID having a value that is base[d] on the particular pattern of measured current differences for all cells of array 46.” Ex. 1 ['188 Patent] at 5:51-56.

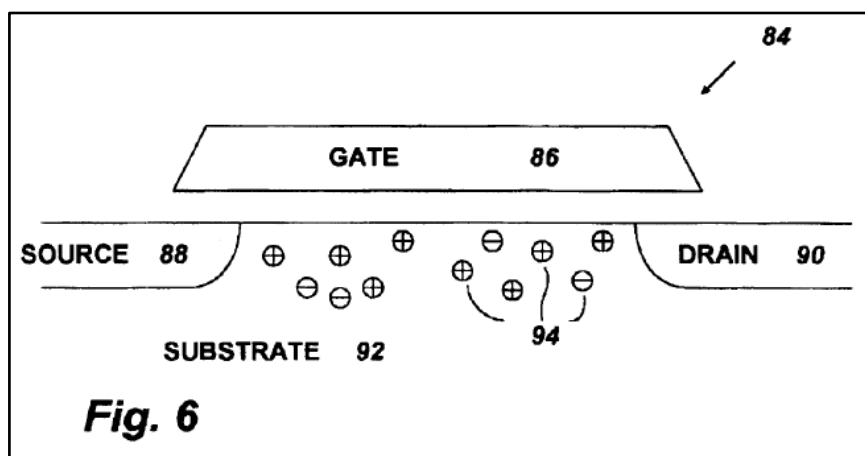
27. Figure 3 of the '188 Patent depicts more detail regarding an embodiment of an identification cell array:



Ex. 1 ['188 Patent] at Fig. 3.

28. Notably, Figure 3 is merely one example of a structure of such an array. As the specification teaches: “the number of cells 62 that should be included in array 46 is largely a function of the number of ICs to be uniquely identified.” Ex. 1 ['188 Patent] at 12:13-20.

29. The cells themselves may be formed in some embodiments from transistors, such as shown in basic form with respect to Figure 6:



Ex. 1 ['188 Patent] at Fig. 6.

1 30. As further described in the specification: ICID **38** (Figure 2) “may be adapted to
2 provide an output ID that not only uniquely identifies an IC in which it is installed but also
3 includes a ‘type code’ indicating aspects of the IC that is has in common with other ICs sharing
4 the same photomask, such as its type, source of manufacture, etc. Thus, an output ID of ICID 38
5 would include one field having a value that is unique to the IC in which it is installed and another
6 field having a value that is common to all similar ICs.” Ex. 1 [‘188 Patent] at 5:62-64.

7 31. Further, the specification explains that the output ID can be stored in a database
8 and used to later identify the specific part. Ex. 1 [‘188 Patent] at 14:55-15:8. Similarly, if a part
9 is tested and found not to be in the database, then it may be determined to be a counterfeit. Ex. 1
10 [‘188 Patent] at 15:12-13.

11 32. Additionally, an output ID “may be stored on the chip itself as a sequence of
12 values in an on-chip Random Access Memory (RAM) which may be non-nonvolatile. The RAM
13 may be part of a microprocessor on-board cache, and available to software executed by that
14 microprocessor. This arrangement allows fast access to the ID during use” Ex. 1 [‘188 Patent]
15 at 16:5-10.

16 33. The innovativeness of the solutions taught in the ‘188 Patent is clear from the
17 industry’s myriad references to it and its predecessor patent.⁸ By way of example, the ‘213
18 Patent (predecessor to ‘188 Patent) has been cited in patent documents all over the world more
19 than 260 times by the likes of Advanced Micro Devices⁹, Analog Devices Inc.¹⁰, Fujitsu¹¹,

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23 ⁸ See, e.g., Erik Oliver et al., Finding the Best Patents – Forward Citation Analysis Still Wins,
24 IPWatchdog (Mar. 24, 2016), <http://www.ipwatchdog.com/2016/03/24/finding-best-patents-forward-citation-analysis-still-wins/id=67192/> (“We’ve identified five primary factors for
25 consideration in patent ranking (in order of weighting): Forward citations (45%) Age of patent
26 from priority date (19%) Independent claim count (adjusted by number of means claims) (14%)
27 Claim 1 word count (12%) Family size and international filings (10%) **We were surprised to
discover that forward citations dominate the analysis. We evaluated millions of patents –
and consistently forward citations were the biggest predictor of a higher value patent.**”)
(emphasis added).

28 ⁹ See, e.g., US6968303.

¹⁰ See, e.g., US6480136.

¹¹ See, e.g., US6862725 and US7062346.

1 Hewlett Packard¹², Hitachi¹³, IBM¹⁴, Intel¹⁵, Intrinsic ID¹⁶, MIT¹⁷, National Semiconductor¹⁸,
 2 Nokia¹⁹, Panasonic²⁰, Philips²¹, Samsung²², STMicroelectronics²³, Synaptics²⁴, Texas
 3 Instruments²⁵, and Verayo²⁶. And despite the ‘188 Patent issuing more than eight years after the
 4 ‘213 Patent, and almost a decade after the original filing date, it continues to be cited in
 5 contemporary patents and patent applications.²⁷

6 34. UPF is the owner and assignee of the patent-in-suit as recorded by the USPTO at
 7 Reel/Frame: 042956/0213.

8 COUNT I

9 (DIRECT INFRINGEMENT OF U.S. PATENT NO. RE40,188 AGAINST RENESAS)

10 35. UPF restates and incorporates by reference the preceding paragraphs of this
 11 Complaint as if fully set forth herein.

12 36. UPF is the owner by assignment of the ‘188 Patent. A true and correct copy of the
 13 ‘188 Patent is attached hereto as Exhibit 1.

14 37. On information and belief, Renesas makes, uses, sells, offers to sell, and/or
 15 imports products incorporating PUF technology, including the RX231 Wi-Fi Cloud Connectivity
 16 Kit (the “Renesas Accused Products”).

17 38. On information and belief, to the extent the preamble of claim 21 of the ‘188
 18 Patent is limiting, the Renesas Accused Products comprise an apparatus in an integrated circuit

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 20 _____
 21 ¹² See, e.g., US6960753 and US6889305.

22 ¹³ See, e.g., US6941536 and US7665049.

23 ¹⁴ See, e.g., US8214169 and US8619979.

24 ¹⁵ See, e.g., US7813507 and US7102358.

25 ¹⁶ See, e.g., US20030204743.

26 ¹⁷ See, e.g., US7681103 and US7757083.

27 ¹⁸ See, e.g., US7602666 and US7482657.

28 ¹⁹ See, e.g., US7356627.

²⁰ See, e.g., US7655483 and US8510608.

²¹ See, e.g., WO/2004/017408 and WO/2004/105125.

²² See, e.g., US6600686.

²³ See, e.g., US8745107 and US7334131.

²⁴ See, e.g., US8698594 and US9697411.

²⁵ See, e.g., US6952623.

²⁶ See, e.g., US8782396 and US8683210.

²⁷ See, e.g., US9506983 and US9568540.

1 (IC) for generating an identification number (ID) identifying the IC. For example, the Renesas
2 Accused Products contain design security systems to protect against tampering, cloning,
3 overbuilding, reverse engineering, and counterfeiting, as well as providing traceability through
4 the entire lifetime of the system. Among these design security features are physically unclonable
5 functions (“PUFs”). On information and belief, the “PUF” technology incorporated into the
6 Renesas Accused Products make use of SRAM cells (“an apparatus in an integrated circuit (IC)”)
7 that generate startup values of SRAM memory, these values forming a unique chip fingerprint
8 called the SRAM PUF response (“generating an identification number identifying the IC”).

9 39. On information and belief, the Renesas Accused Products comprise an
10 identification circuit formed within the IC, the identification circuit outputting signals that are a
11 substantial function of random parametric variations in the IC. On information and belief, the
12 Renesas Accused Products have transistors in SRAM cells that have random electric properties
13 due to sub-micro process variations in the manufacturing process (“an identification circuit
14 formed within the IC...random parametric variations in the IC”). On information and belief,
15 these random electric properties are expressed in the startup values of uninitialized SRAM
16 memory or blocks into a unique pattern of 0’s and 1’s, forming a unique fingerprint called the
17 SRAM PUF response (“the identification circuit outputting signals that are a substantial function
18 of random parametric variations in the IC”).

19 40. On information and belief, the Renesas Accused Products comprise a
20 measurement circuit, the measurement circuit receiving the signals that are a substantial function
21 of random parametric variations in the IC, wherein the measurement circuit generates the ID,
22 wherein the ID is a substantial function of the random parametric variations. For example, on
23 information and belief, the Renesas Accused Products turn the electronic fingerprint or footprint
24 into a strong secret cryptographic key (“receiving the signals that are a substantial function of
25 random parametric variations in the IC, wherein the measurement circuit generates the ID,
26 wherein the ID is a substantial function of the random parametric variations”). On information
27 and belief, these secret cryptographic keys are not stored on the chip but are extracted from the
28

1 chip only when needed. On information and belief, these secret cryptographic keys can be used
2 as a root key to wrap or manage user keys.

3 41. By making, using, testing, offering for sale, selling, and/or importing integrated
4 circuits and devices incorporating those integrated circuits, including but not limited to the
5 Renesas Accused Products, Renesas has injured UPF Innovations and is liable to UPF
6 Innovations for directly infringing one or more claims of the '188 Patent, including at least Claim
7 21, pursuant to 35 U.S.C. § 271(a).

8 42. As a result of Renesas's infringement of the '188 Patent, UPF has suffered
9 monetary damages, and seeks recovery in an amount adequate to compensate for Renesas's
10 infringement, but in no event less than a reasonable royalty for the use made of the invention by
11 Renesas together with interest and costs as fixed by the Court.

12 43. Renesas has had knowledge of the '188 Patent since at least February 1, 2018,
13 when it was given notice by letter of the '188 Patent and of Renesas's need to obtain a patent
14 license from UPF. Renesas has also had knowledge of the '188 Patent since the date of service
15 of this Complaint or shortly thereafter, and on information and belief, Renesas knew of the '188
16 Patent and knew of its infringement, including by way of this lawsuit.

17 44. Upon information and belief, Renesas's direct infringing activities have continued
18 and are continuing with knowledge of the '188 Patent, and with knowledge of their infringement
19 of the '188 Patent. These infringing activities are, at a minimum, done with reckless disregard
20 and/or willful blindness of UPF's rights under the '188 Patent. Renesas's acts of infringement
21 have therefore been intentional, deliberate, and willful.

22 **COUNT II**

23 **(INDUCING INFRINGEMENT OF U.S. PATENT NO. RE40,188 AGAINST RENESAS)**

24 45. UPF restates and incorporates by reference the preceding paragraphs of this
25 Complaint as if fully set forth herein.

26 46. Renesas has had knowledge of the '188 Patent since at least February 1, 2018,
27 when it was given notice of the '188 Patent and of Renesas's need to obtain a patent license from
28 UPF. Renesas has also had knowledge of the '188 Patent since the date of service of this

1 Complaint or shortly thereafter, and on information and belief, Renesas knew of the '188 Patent
2 and knew of its infringement, including by way of this lawsuit.

3 47. On information and belief, Renesas intended to induce patent infringement by
4 third-party customers and users of the Renesas Accused Products and had knowledge that the
5 inducing acts would cause infringement or was willfully blind to the possibility that its inducing
6 acts would cause infringement. Renesas specifically intended and was aware that the normal and
7 customary use of the Renesas Accused Products would infringe the '188 Patent. Renesas
8 performed the acts that constitute induced infringement, and would induce actual infringement,
9 with the knowledge of the '188 Patent and with the knowledge that the induced acts would
10 constitute infringement. For example, Renesas provides the Renesas Accused Products, which
11 are capable of operating in a manner that infringes one or more claims of the '188 Patent,
12 including at least claim 21, and Renesas further provides advertising, documentation and training
13 materials that cause customers of the Renesas Accused Products to utilize the products and
14 services in a manner that directly infringes one or more claims of the '188 Patent. By advertising
15 to and providing instruction and training to customers on how to use the Renesas Accused
16 Products, Renesas specifically intended to induce infringement of the '188 Patent, including at
17 least claim 21. On information and belief, Renesas engaged in such inducement to promote the
18 sales of the Renesas Accused Products and to actively induce its customers to infringe the '188
19 Patent. Accordingly, Renesas has induced and continues to induce users of the Renesas Accused
20 Products to use the accused products in their ordinary and customary way to infringe the '188
21 Patent, knowing that such use constitutes infringement of the '188 Patent.

22 48. Upon information and belief, Renesas's activities that induce infringement have
23 continued and are continuing with knowledge of the '188 Patent, and with knowledge of their
24 infringement of the '188 Patent. These infringing activities are, at a minimum, done with
25 reckless disregard and/or willful blindness of UPF's rights under the '188 Patent. Renesas's acts
26 of inducing infringement have therefore been intentional, deliberate, and willful.

27 **PRAYER FOR RELIEF**

28 WHEREFORE, Plaintiff UPF respectfully requests that this Court enter:

- 1 (a) A judgment in favor of Plaintiff UPF that Renesas has directly infringed the ‘188
2 Patent, either literally and/or under the doctrine of equivalents;
- 3 (b) A judgment in favor of Plaintiff UPF that Renesas has induced infringement of the
4 ‘188 Patent;
- 5 (b) An award of damages resulting from Renesas’s acts of infringement in accordance
6 with 35 U.S.C. § 284;
- 7 (c) A judgment and order requiring Renesas to provide accountings and to pay
8 supplemental damages to UPF, including, without limitation, prejudgment and post-
9 judgment interest; and
- 10 (d) A finding of willful infringement by Renesas and an award to UPF of enhanced
11 damages pursuant to 35 U.S.C. § 284;
- 12 (e) Any and all other relief to which UPF may show itself to be entitled.

13 Dated: May 10, 2018

Respectfully Submitted,

14 /s/ Naomi Jane Gray

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JURY DEMAND

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, UPF requests a trial by jury of any issues so triable by right.

Dated: May 10, 2018

Respectfully Submitted,

/s/ Naomi Jane Gray

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