

United States Court of Appeals
for the Federal Circuit

SPANSION, INC. AND SPANSION, LLC,
Appellants,

AND

FREESCALE SEMICONDUCTOR, INC.,
Appellant,

AND

ATI TECHNOLOGIES, ULC,
Appellant,

AND

STMICROELECTRONICS N.V.,
Appellant,

AND

QUALCOMM INCORPORATED,
Appellant,

v.

INTERNATIONAL TRADE COMMISSION,
Appellee,

AND

TESSERA, INC.,
Intervenor.

2009-1460, -1461, -1462, -1465

On appeal from the United States International Trade Commission in Investigation No. 337-TA-605.

Decided: December 21, 2010

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Before LOURIE, FRIEDMAN, and LINN, *Circuit Judges*.
LINN, *Circuit Judge*.

Tessera, Inc. (“Tessera”) filed a complaint with the United States International Trade Commission (“the Commission” or “ITC”) on April 17, 2007 under section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337(a)(1)(B), alleging that seven respondents infringed U.S. Patents No. 5,852,326 (the “326 patent”) and No. 6,433,419 (the “419 patent”) through the importation or sale of certain semiconductor chips or products containing such chips. See *In re Certain Semiconductor Chips with Minimized Chip Package Size and Products Containing Same*, 72 Fed. Reg. 28521 (Int’l Trade Comm’n May 21, 2007).

Tessera named as respondents Spansion, Inc. and Spansion, LLC (collectively, “Spansion”); Freescale Semiconductor, Inc. (“Freescale”); ATI Technologies, ULC (“ATI”); STMicroelectronics N.V. (“STMicro”); QUALCOMM, Inc. (“Qualcomm”); and Motorola, Inc. (“Motorola”) (collectively, “Respondents”). Motorola subsequently settled its dispute with Tessera and was dismissed from the case. All other Respondents (collectively “Appellants”) now appeal the Commission’s final determination, ruling that Appellants directly infringe the asserted claims of the ’326 patent and contributorily infringe the asserted claims of the ’419 patent. *In re Certain Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*, No. 337-TA-605, slip op. at 79 (Int’l Trade Comm’n May 20, 2009) (Public Version) (“Final Determination”). Because the Commission’s decision is supported by substantial evidence and is not contrary to law, this court affirms.

I. BACKGROUND

A. Technology

The ’326 and ’419 patents, share a common specification and describe semiconductor chip packages. A semiconductor chip is a widely used miniaturized electronic circuit that has been manufactured in the surface of semiconductor material. A semiconductor chip package includes both the casing, which protects the chip, and the electrical connections (sometimes called “terminals” or “contact pads”), which allow the chip to be attached to a printed circuit board (“PCB”). The printed circuit board, in turn, can be connected to other components of an electrical device.

The present investigation relates to semiconductor packages containing face-up semiconductor chips in ball grid array assemblies. These are packages designed such

that the side of the chip containing the electrical contacts (the “face” of the chip) faces away from a backing element (also referred to as a substrate, package substrate, or interposer) on which the chip is mounted via “die attach,” which is the material used to mount the chip on the backing element.¹ The electrical contacts on the top of the chip are connected to the top side of the backing element by fine wires called “leads.” The bottom side of the backing element has terminals that are laid out in a grid pattern. These terminals are intended to be electrically attached to the contact pads on the printed circuit board using solder balls. An encapsulant encases the package to provide insulation and protection of the package components. Figure 2 depicts a sectional view of a face-up ball grid array chip package electrically attached to a PCB.

¹ The word substrate generally refers to an underlying layer and may be used to refer to different things depending on context. Throughout the record, the word substrate is used in different places to refer to different components. Substrate is sometimes used to refer to the layer within the semiconductor package on which the chip is attached using die attach (see label “Package Substrate” in the figure below). This component is referred to in the patents as the “backing element.” Substrate is also used to refer to the printed circuit board (external to the semiconductor package) on which the package is attached using solder balls (see “PCB” in the figure below). In the patents, the word substrate refers to the printed circuit board. For purposes of clarity, this opinion will use the words backing element and printed circuit board instead of substrate when referring to the respective structures.

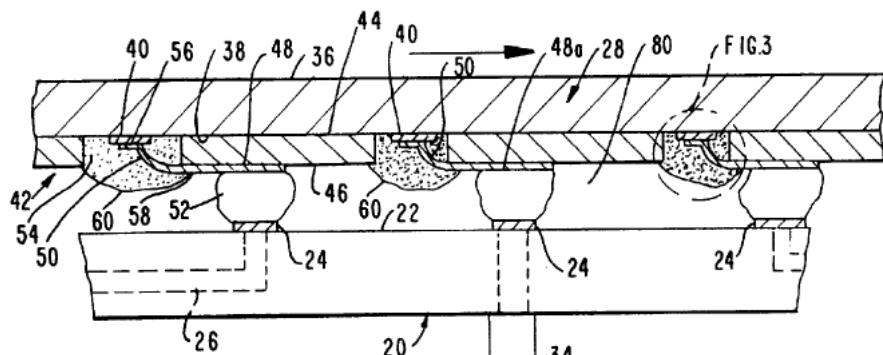


FIG. 2

As shown in Figure 2, chip 28 with electrical contacts 40 is mounted on a substrate (PCB) 20 with an interposer/package substrate 42 between the chip and the PCB. '326 patent col.10 ll.23-67. The solder balls 52 bond each terminal 48 to the associated contact pad 24. *Id.* Each terminal 48 is also connected to one of the contacts 40 on chip 28 by a flexible lead 50. *Id.* Electrical devices generate heat during operation and subsequently cool when operation ceases. The electrical interconnections within the package (between the semiconductor chip and the backing element) and between the package and the printed circuit board are subjected to substantial strain resulting from expansion and contraction caused by these changes in temperature. Since the components are ordinarily formed by different materials having different coefficients of thermal expansion, the chip, the backing element, and the printed circuit board expand and contract by different amounts with each power cycle. This difference, called the differential thermal expansion, causes the electrical contacts on one component to move relative to the contacts of another component to which it is attached as the temperatures of the different components change. For instance, a semiconductor chip has a much lower coefficient of thermal expansion than either

the backing element or the printed circuit board. During heating, the backing element beneath the chip tends to be constrained by the chip and expands much less than the board on which it is mounted, causing relative movement there between. This relative movement causes mechanical stress on the solder balls because the bottoms of the solder balls get pulled outward relative to the tops causing distortion. Repeated cycles of heating and cooling can ultimately lead to permanent damage to the solder balls and breakage of the electrical interconnections.

The patents at issue describe a semiconductor package with the ability to accommodate this relative movement between components by inserting a layer of compliant material that is “flexible, compressible, and/or elastic” between the chip and its backing element. ’326 patent col.3 ll.61-64 (“Most preferably, a compliant layer is disposed between said terminals and said chip so that said compliant layer will be compressed upon movement of said terminals toward said chip.”); *see also In the Matter of Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-605, slip op. at 42 (Int’l Trade Comm’n Dec. 1, 2008) (Public Version) (“Initial Determination”). This compliant layer permits the terminals on the backing element to move relative to the chip inside the package offsetting some of the stress on the solder balls due to differential thermal expansion. The reduction of stress on the solder balls in turn decreases the occurrence of package failure and improves the reliability of the electrical devices containing such packages.

Tessera asserted claims 1, 2, 6, 12, 16-19, 21, 24-26, and 29 of the ’326 patent and claims 1-11, 14, 15, 19, and 22-24 of the ’419 patent against Respondents. Claim 1 of the ’326 patent and claim 1 of the ’419 patent are representative of the asserted claims and are set forth below

with emphasis added to show limitations disputed in this appeal:

'326 patent:

1. A semiconductor assembly comprising:
 - a semiconductor chip having oppositely facing front and rear surfaces and edges extending between said front and rear surfaces, said chip further having contacts on a peripheral region of said front surface;
 - a backing element having electrically conductive terminals and lead portions thereon, wherein said lead portions are connected to said terminals, said backing element overlying said rear surface of said semiconductor chip such that at least some of said terminals overlie said rear surface of said chip;
 - bonding wires connected to said contacts on said front surface of said chip, *said bonding wires extending downwardly alongside said edges of said chip* and being connected to the lead portions on the backing element;
- wherein said terminals are movable with respect to said chip.*

'326 patent col.34 ll.18-36 (emphases added).

'419 patent:

1. A semiconductor assembly comprising:
 - a) a semiconductor chip having a front surface, a rear surface and contacts on

said front surface, said semiconductor chip having a coefficient of thermal expansion;

b) a substrate [PCB] adapted to physically support the chip and electrically interconnect the chip with other elements of a circuit, said substrate having a set of contact pads thereon, said substrate having a coefficient of thermal expansion, said semiconductor chip overlying said substrate so that said chip overlies at least some of said contact pads of said set and so that said rear surface of said chip faces toward said substrate and said contact pads:

c) a backing element having electrically conductive terminals and electrically conductive lead portions electrically connected to said terminals and to said contacts on said chip, said backing element having a central region aligned with said chip and disposed between said rear surface of said chip and said substrate, said terminals of said backing element being bonded to said contact pads on said substrate, at least some of said terminals of said backing element being disposed in said central region of said backing element *and being movable with respect to the chip to compensate for differential thermal expansion of the chip and substrate.*

'419 patent col.34 ll.18-43 (emphasis added).

Prior to the invention described in the '326 and '419 patents, the differential thermal expansion problem was known. Several design strategies to address the problem

also were known. One strategy, called “CTE matching,” selects materials for package components that have similar coefficients of thermal expansion. Another strategy uses solder balls made of deformable material to absorb some of the strain. Both of these strategies were disclosed in prior art U.S. Patent No. 5,216,278 (the “Lin patent”). During prosecution of the ’419 patent, the patent examiner rejected the pending claims as anticipated by the Lin patent. To overcome this rejection, Tessera distinguished solder ball deformation and CTE matching from the “claimed movement.” *Id.* at 48. Much of the ITC investigation and the arguments in this appeal revolve around the definition of “claimed movement” and how to determine whether it exists in the accused devices.

The claims of the ’326 and ’419 patents recite that the terminals on the bottom of the backing element are movable with respect to the semiconductor chip. ’326 patent col.34 ll.35-36 (“terminals are movable with respect to said chip”); ’419 patent col.34 ll.41-44 (“terminals . . . movable with respect to the chip to compensate for differential thermal expansion of the chip and substrate”); *id.* col.35 ll.32-35 (“movement of said terminals . . . with respect to the chip to compensate for differential thermal expansion of the chip and substrate”). Consistent with Tessera’s statements during prosecution, the Commission construed all of these limitations to “require that ‘in the operation of the assembly, the terminals are capable of being displaced relative to the chip by *external loads* applied to the terminals, to the extent that the displacement appreciably relieves mechanical stresses, such as those caused by [differential thermal expansion] which would be present in the electrical connections absent such displacement.’” *Final Determination* at 14 (quoting *Initial Determination* at 57-58). By using the term “*external loads*,” the ALJ differentiated between the move-

ment of a package's components caused by internal loads versus those caused by external loads. Internal loads result from the inherent expansion and contraction of components inside the package as temperature changes, and are generated whether the package is connected to a printed circuit board ("on-board") or not ("off-board"). Movement resulting from internal loads (i.e. "CTE matching") was disclaimed by Tessera as present in the prior art. External loads are forces that a printed circuit board exerts on a package because of differential thermal expansion and, because they involve a printed circuit board, can only occur when the package is on-board. The claimed movement is only that movement resulting from external loads (i.e. the use of a compliant layer between the chip and backing element) that allows the backing element to move with the printed circuit board. Thus, under the ALJ's construction, to prove that an accused package infringes the asserted claims, Tessera must show that: "(1) the terminals are capable of being displaced with respect to the chip by external loads and (2) the displacement caused by the external loads appreciably relieves mechanical stresses." *Initial Determination* at 58. Tessera does not dispute this construction.

To show that the accused products practiced the claimed movement and that movement appreciably relieved mechanical stress, Tessera's expert, Dr. Qu, analyzed a subset of the accused products from each Respondent. Much of this appeal concerns Respondents' contention that Dr. Qu's test results do not support the ITC's finding of infringement. Specifically, Dr. Qu selected seven packages from ATI, eight from Freescale, nine from Qualcomm, nine from Spansion, and nineteen from STMicro, for a total of 52 representative products. *Id.* at 56. Dr. Qu performed several tests on each of the representative products to determine whether they prac-

ticed the claimed movement. The first two tests consisted of a type of computer simulation known as finite element analysis modeling. To perform such an analysis on a chip package, a computer representation is created by inputting numeric values representing the chip package's materials, including geometric dimensions and physical properties, into modeling software. This computer representation of a package is then subjected to simulated physical conditions, such as thermal cycling, to generate an approximation of how the package will operate in the physical world. This modeling is well accepted and used throughout the electronic industry for predicting and confirming reliability of semiconductor packages, but it is not generally concerned with which specific components may be responsible for the improvement. *Id.* at 58 n.16.

For both of his modeling tests, Dr. Qu created computer representations of the 52 representative accused products. In addition, for each of the 52 representative products, Dr. Qu created a corresponding hypothetical "baseline" package. The baseline packages were to be identical in every way to the actual packages except that they were designed not to have any movement due to external loads. To this end, the compliant layer was virtually removed in the baseline packages. This was accomplished by replacing the numeric values representing the compliant layers between the chip and the backing element with stiffer materials.

Dr. Qu's first modeling test ("Test 1"), also called the "thermal cycling test," simulated thermal cycling of each of the accused packages and each of the baselines with the packages on-board. Dr. Qu then compared the movement of the actual package with the movement of the corresponding baseline package. According to Dr. Qu, since the baseline package would show only movement due to internal forces, any movement in the actual package

above the movement in the baseline would be due solely to external forces. Dr. Qu also calculated the resulting “plastic work,” a measure of stress on the solder balls, for each of the accused and corresponding baseline packages.

Dr. Qu’s second modeling test (“Test 2”), also called the “direct loading” test, compared the off-board and on-board behavior of the representative accused packages during thermal cycling. According to Dr. Qu, modeling the representative accused packages off-board isolated movement due to solely internal loads because external loads, by definition, only occur when the packages are on-board. On the other hand, modeling representative accused packages on-board resulted in movement due to both internal and external loads. Accordingly, to find the movement due only to external loads, Dr. Qu subtracted the displacement shown by the off-board configuration from that shown by the on-board configuration. Dr. Qu acknowledged that one problem with Test 2 was the requirement of a “linearity assumption.” In reality, movement in the system is non-linear—movement in the on-board configuration (when both internal and external loads are applied) is not exactly the sum of the movements due to internal and external loads alone when they are separately applied. Instead, there is some interaction between the internal loads and external loads. When a package is on-board, the movement caused by external loads may cause more or less movement to occur due to internal loads. However, since Dr. Qu could not quantify the nonlinearity in the system, he had to make the “linearity assumption,” that movement due to internal and external loads on-board is the sum of movement due to internal and external loads applied separately. After approximating the amount of displacement due to external loads by subtracting the off-board displacement from the on-board displacement, Dr. Qu then applied this

external load to the bottom of the solder balls on off-board models of both the actual and baseline packages. Applying this calculated external load to a package approximated the stress caused by external loads during thermal cycling. Dr. Qu then assessed the effect of this stress by measuring the amount of damage to the solder balls in both packages. He found that there was improved reliability in the modeled actual packages as compared to the baseline packages.

Dr. Qu performed one last test, the “Moirè test,” designed to validate the modeling tests. Moirè testing is an experimental technique (not a computer simulation) in which a physical chip package is cut in half and then a grating with very fine lines is epoxied to the cross-section. Lasers are used to make optical measurements of that sample at different temperatures in order to determine the displacements at various points on the package. Dr. Qu performed Moirè testing on only four of the 52 representative models and used a narrower temperature range, between +25°C and +75°C, than used for the thermal cycling modeling analysis, which ranged between -25°C and +125°C.

B. Procedural History

The ITC instituted this investigation on May 21, 2007. On December 1, 2008, the presiding administrative law judge (“ALJ”) issued the *Initial Determination*, finding that Tessera had not met its burden to show that the accused products infringed the asserted claims of either the ’326 patent or the ’419 patent. *Initial Determination* at 121. The ALJ also found that the asserted claims of both patents were not invalid (1) under 35 U.S.C. § 112 ¶ 1 for failing to satisfy the enablement or written description requirements; (2) under 35 U.S.C. § 112 ¶ 2 for

indefiniteness; (3) under 35 U.S.C. § 102 for anticipation; or (4) under 35 U.S.C. § 103 for obviousness. *Id.* at 119.

On February 22, 2008, based on an ex parte reexamination requested by a non-party and granted by the United States Patent and Trademark Office (“PTO”) before Tessera filed its complaint in the ITC, Respondents filed a joint motion to stay the ITC proceedings pending the reexamination. The ALJ granted the motion. The Commission reversed the ALJ’s order and denied Respondents’ stay motion. *In the Matter of Certain Semiconductor Chips with Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-605, 2008 WL 2223426 (Int’l Trade Comm’n May 27, 2008). Respondents then sought a writ of mandamus from this court to vacate the Commission’s denial. This court denied the petition because petitioners had not shown that their right to the writ was clear and indisputable and because the Commission’s explanation, “that reexamination proceedings were at an early stage, that the reexamination proceedings might not reach completion before patents’ expiration, and that the Commission investigation was at an advanced stage,” was a sufficient basis for denial of a stay. *In re Freescale Semiconductor, Inc.*, 290 Fed. App’x 326, 326 (Fed. Cir. 2008).

On January 30, 2009, the Commission stated that it would review portions of the *Initial Determination*. Specifically, the Commission noted that it would review the ALJ’s findings that (1) the accused devices did not infringe; (2) Tessera waived indirect infringement of the ’419 patent; and (3) Motorola’s invention of the 1989 68HC11 OMPAC chip did not anticipate the asserted patents. *In the Matter of Certain Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*; Notice of Commission Decision To Review in Part a Final Determination Finding No Violation of

Section 337, 74 Fed. Reg. 6175-76 (Feb. 5, 2009). After briefing by the parties, the Commission, on May 20, 2009, issued the *Final Determination* overturning, in part, the ALJ's holdings. The Commission found both direct and contributory infringement and issued both limited exclusion and cease-and-desist orders.

Spansion and Freescale sought from this court a stay, pending appeal, of the Commission's orders. This court denied that motion, concluding that Spansion and Freescale had neither met their burden of showing a strong likelihood of success on the merits nor shown that the harm factors militated in movants' favor. *Spansion, Inc. v. Int'l Trade Comm'n*, Nos. 2009-1460, -1461, -1462, -1465, 2009 WL 2876448 (Fed. Cir. Sept. 8, 2009).

On appeal, Appellants challenge two aspects of the Commission's determination of the meaning of the claims. First, Appellants assert that all the asserted claims are indefinite because the moveable limitation is insolubly ambiguous. Second, Appellants object to the Commission's construction of the claim limitation "downwardly alongside." Appellants also appeal the Commission's finding of both direct and contributory infringement, asserting that Tessera failed to meet its burden to show that the accused products practice the claimed movement. Finally, Appellants contend that the asserted claims of both the '326 and '419 patents are invalid and appeal the Commission's finding that they are not anticipated. Spansion, on its own, also argues that the Commission's award of prospective injunctive relief was erroneous because it did not properly take into consideration the public interest. This court has jurisdiction under 28 U.S.C. § 1295(a)(6).

II. DISCUSSION

A. Standard of Review

This court reviews the Commission's legal determinations de novo and the Commission's factual findings for substantial evidence. *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003). Under the substantial evidence standard, “[a] reviewing court must consider the record as a whole, including that which fairly detracts from its weight, to determine whether there exists such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.” *Nippon Steel Corp. v. U.S.*, 458 F.3d 1345, 1351 (Fed. Cir. 2006) (internal quotation marks omitted). This court “must affirm a Commission determination if it is reasonable and supported by the record as a whole, even if some evidence detracts from the Commission’s conclusion.” *Id.* at 1352 (internal quotation marks omitted).

B. Claim Construction

1. Indefiniteness

The ALJ found that the claims were not invalid for indefiniteness. *Initial Determination* at 105-06. The Commission adopted the conclusions of the ALJ on this issue. *Final Determination* at 76. “Indefiniteness requires a determination whether those skilled in the art would understand what is claimed.” *Enzo Biochem, Inc. v. Applera Corp.*, 599 F.3d 1325, 1332 (Fed. Cir. 2010) (internal quotation marks omitted). To make that determination, general principles of claim construction apply. *Id.* at 1331 (internal quotation marks omitted). While claim construction primarily relies on intrinsic evidence, extrinsic evidence, such as expert testimony, may also be used when given the appropriate weight by the trial court. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342,

1348 (Fed. Cir. 2005). “Because a patent is presumed to be valid, the evidentiary burden to show facts supporting a conclusion of invalidity is one of clear and convincing evidence.” *Id.* at 1345. This court reviews the Commission’s determination on indefiniteness de novo. *Exxon Research & Eng’g Co. v. United States*, 265 F.3d 1371, 1376 (Fed. Cir. 2001).

On appeal, Appellants argue that the ALJ incorrectly determined that the “moveable” limitation found in each of the asserted claims is not indefinite. As described above, the ALJ interpreted the movable limitation to require that “in the operation of the assembly, the terminals are capable of being displaced relative to the chip by external loads applied to the terminals, to the extent that the displacement appreciably relieves mechanical stresses, such as those caused by differential thermal expansion which would be present in the electrical connections absent such displacement.” *Initial Determination* at 57-58. Appellants contend that a person of ordinary skill would not understand whether movement of the terminals “appreciably relieve[d] mechanical stresses” as required by the Commission’s construction and thus would not be able to determine how much movement constitutes infringement. Appellants argue that because the patents do not define any standard for measuring stress relief, there is no anchor for determining when stress relief is “appreciable.” Moreover, Appellants contend that the asserted patents fail to distinguish between the claimed movement and other unclaimed movement that is present in chip packages. Tessera responds that the Commission correctly determined that the “moveable” language is definite, arguing that both the specification and expert testimony support the Commission’s conclusion that a person of ordinary skill would understand the boundaries of the claims. This court

agrees with the Commission that the claims are not indefinite.

First, this court is not persuaded by Appellants' argument that the claims do not provide a way to determine how much movement constitutes infringement. The ALJ found that "the evidence shows that one skilled in the art would readily be able to understand the scope of the asserted claims of the '326 and '419 patents when read in light of the specifications." *Id.* at 105. Both the intrinsic and extrinsic evidence support this finding.

The intrinsic evidence provides guidance both on the mechanical stresses that cause the problem and the kind of movement that will relieve those stresses. The specification identifies the cause of the mechanical stress resulting from thermal cycling as the "relative movement [which] deforms the electrical interconnections between the chip and substrate." '326 patent col.2 ll.17-19. It then goes on to identify a solution to the problem in providing "a compliant layer [] disposed between said terminals and said chip so that said compliant layer will be compressed upon movement of said terminals toward said chip." *Id.* col.3 ll.61-64. This disclosed and described movement is what "provides compensation for differential thermal expansion of the chip and substrate," *Id.* col.4 ll.9-11, and enables "the assembly [to be] substantially resistant to thermal cycling." *Id.* col.20 l.40.

The extrinsic evidence also supports the ALJ's finding. Experts for both Tessera and Appellants testified that one of ordinary skill in the art would have been able to determine the boundaries of the claims. For example, Appellants' expert, Dr. Sitaraman stated that he was "able to conduct a noninfringement analysis based on the Tessera description" and that he was "able to find out the movement due to external forces alone." Trial Ex. RX-

3179C (witness statement of Dr. Sitaraman, Feb. 14, 2008) at ¶ 85, J.A. 78130; Hr'g Tr. 971:6-11 (July 17, 2008), J.A. 12003; *see Initial Determination* at 105 (“[T]he evidence shows that two of [Appellants’] own experts were able to discern the metes and boundaries of the asserted claims. In particular, Dr. Sitaraman was able to discern a dividing line between what an appreciable relief of stress is and what is not. Additionally, Dr. Madenci testified in this Investigation that he was able to determine what would literally be within the scope of the asserted claims.” (internal citations omitted)). In addition, Tessera’s expert, Dr. Ivey, stated that “a person of ordinary skill in the art would have understood that the claimed movement required terminals that could move relative to the chip to provide substantial compensation for differential thermal expansion and thus significantly improve reliability at the connections.” Trial Ex. CX-3205C ¶ 377, J.A. 51424 (witness statement of Dr. Ivey, Feb. 16, 2008). The ALJ had the right to credit that testimony. *See Datamize*, 417 F.3d at 1348; *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576 (Fed. Cir. 1986). This court does not find persuasive Appellants’ arguments that the ALJ misinterpreted the expert testimony.

Moreover, the claims were intended to cover the use of the invention with semiconductor packages made of a number of materials, each having different coefficients of thermal expansion and differing thermal expansion rates. Interpreting the claimed term “movable” in terms of appreciable relief of mechanical stress is as precise as need be and “reasonably apprise[s] those skilled in the art both of the utilization and scope of the invention.” *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 624 (Fed. Cir. 1985) (internal quotations omitted).

Second, this court disagrees with Appellants’ argument that the asserted claims are indefinite because the

patents provide no method for distinguishing claimed movement from unclaimed movement. Whether a patent clearly differentiates itself from specific prior art “is an important consideration in the definiteness inquiry.” *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1252 (Fed. Cir. 2008). Here, the prosecution history clearly differentiates claimed from unclaimed movement. During prosecution of the ’419 patent, the patent examiner rejected the pending claims as anticipated by the Lin patent. In response, Tessera distinguished the Lin patent by differentiating solder ball deformation and “CTE matching” from the claimed movement. *Initial Determination* at 48 (“Indeed, Lin’s teaching that one should rely upon deformable solder balls and CTE matching of the ‘carrier substrate 12’ and the printed circuit board as a full and adequate solution to the problem of solder joint fatigue leads away from any suggestion that one should provide terminals movable relative to the chip to deal with this problem.”) (quoting Trial Ex. JX-0003 prosecution history of the ’419 patent, amendment dated Aug. 20, 2001 at 4-5). Thus, the prosecution history makes clear that claimed movement is limited to movement caused by external loads as opposed to movement caused by internal loads.

Although determining whether claimed movement was present in the accused packages required an expert using detailed computer simulations, this alone does not indicate that the claims are indefinite. The difficulty or complexity of the infringement analysis does not necessarily speak to whether a claim is definite or not. See *Datamize*, 417 F.3d at 1354 (stating that “indefiniteness does not depend on the difficulty experienced by a particular person in comparing the claims with the prior art or the claims with allegedly infringing products or acts”); *SmithKline Beecham Corp. v. Apotex Corp.*, 403 F.3d

1331, 1340-41 (Fed. Cir. 2005) (“The test for indefiniteness does not depend on a potential infringer’s ability to ascertain the nature of its own accused product to determine infringement, but instead on whether the claim delineates to a skilled artisan the bounds of the invention.”). Appellants did not carry their burden of persuading the Commission, nor have they persuaded this court, that the asserted claims of the ’326 and ’419 patents are invalid for indefiniteness.

2. “Downwardly Alongside”

Appellants appeal the Commission’s construction of the claim limitation “bonding wires extending downwardly alongside said edges of said chip” included in claim 1 of the ’326 patent. The Commission construed the limitation to mean “along the side of the semiconductor chip, with the caveat that one of ordinary skill in the art would understand that through the wire bonding process, the bonding wires may extend up, outward and then downward toward the backing element.” *Initial Determination* at 39-40. The Commission based this finding on the specification’s description of the bonding wires as conventional and the understanding of one of skill in the art that the conventional wire bonding process may cause bonding wires to extend up, out, and then down. *Id.* at 38-39.

Appellants argue that this construction impermissibly broadens the claim limitation and renders the term “alongside” superfluous because it does not specify how far from the semiconductor chip edge the bonding wires are allowed to fan out. Appellants’ position is that the specification and prosecution history require that the limitation define “alongside” as being “in close proximity” to the edges of the semiconductor chip. Specifically, Appellants cite Figure 26 in the ’326 patent and its de-

scription stating “alongside the chip, in close proximity to the edges of the chip” as defining “alongside” to include the limitation “in close proximity.” ’326 patent col.31 ll.14-15. In addition, Appellants assert that the specification does not support the Commission’s finding that the invention discloses using conventional wire bonding because Figure 29 distinguishes between a subassembly embodying the claimed invention and another chip that uses conventional bonding wires. Finally, Appellants contend that the prosecution history confirms that “alongside” means “in close proximity” because during the prosecution of U.S. Patent No. 5,347,159 (the “159 patent”), the parent of the ’326 patent, the inventors expressly distinguished their invention from the prior art Kishida patent for not disclosing conductive leads “alongside” the edges of a chip. Instead, the inventors stated that the prior art conductive leads “extend outwardly from the various chips rather than upwardly alongside of the chips.” This court is not persuaded by any of these arguments.

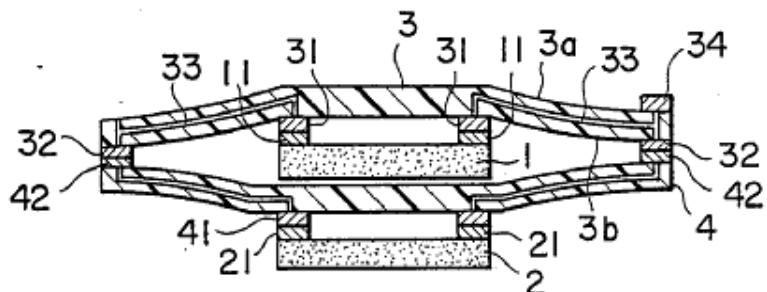
This court agrees with the ALJ that the proper construction of “downwardly alongside” includes conventional bonding wires. The specification discloses only conventional wires that are connected between elements using a conventional wire bonding process. ’326 patent col.29 ll.26-46. Figure 14 demonstrates conventional bonding wires extending up, out, and then down. *Id.* col.18 ll.58-60. Appellants do not disagree that conventional wire bonds attaching elements on one side of the chip to elements on the other extend up, out, and then down. In fact, Appellants concede that all the accused products use conventional wire bonding, with wires that extend “up from the chip contacts, and out and away from the chip” before extending down to attach to contacts on the rear side of the chip. Freescale’s Principal Br. at 59-60. And

Appellants do not point to any language in the specification that discloses wires bonded in a different manner.

Figure 26 discloses the use of trace leads, labeled 948, in addition to bonding wires, labeled 928. Appellants' reliance on this figure and its description including the phrase "in close proximity" is misplaced because that description refers only to the leads, and not to the bonding wires. '326 patent col.29 ll.19-20. The only bonding wires illustrated in Figure 26 do in fact extend upward, outward and then downward from contacts but then terminate at the point where they connect to trace leads above the face of the chip. Appellant's reliance on Figure 29 is similarly misplaced. Figure 29 does not illustrate the use of bonding wires to attach contacts on one side of the chip to terminals on the other side of the chip. Instead, Figure 29 shows a semiconductor package using leads and flaps for this purpose.

Finally, this court is not persuaded that the inventors disclaimed bonding wires not in close proximity to the semiconductor chip in the prosecution of the '159 patent. Appellants argue that the inventors' statement "these wiring films extend outwardly from the various chips rather than upwardly alongside of the chips" distinguishes the prior art Kishida wiring films (shown below) from connections that extend downwardly alongside the semiconductor chip. J.A. 62395. This court does not agree.

FIG. 3



First, the '159 patent claims disclose leads and flaps rather than bonding wires for electrically connecting one side of the semiconductor chip to the other. Therefore, any disclaimers specifically relating to the type of connection do not apply to the '326 patent. *See Saunders Group, Inc. v. Comfortrac, Inc.*, 492 F.3d 1326, 1333 (Fed. Cir. 2007) (“When the purported disclaimers are directed to specific claim terms that have been omitted or materially altered in subsequent applications (rather than to the invention itself), those disclaimers do not apply.”); *see also Ventana Med. Sys. v. Biogenex Labs.*, 473 F.3d 1173, 1182 (Fed. Cir. 2006) (“[T]he doctrine of prosecution disclaimer generally does not apply when the claim term in the descendant patent uses different language.”); *Invitrogen Corp. v. Clontech Labs., Inc.*, 429 F.3d 1052, 1078 (Fed. Cir. 2005) (“[T]he prosecution of one claim term in a parent application will generally not limit different claim language in a continuation application.”).

Second, even if the inventors’ statement was related not to the type of connection, but to the mutual claim term “alongside,” it is still unclear that it was a disclaimer of connections not in close proximity to the chip edge. Instead of distinguishing the invention from Kashida because of the distance of the wiring films from the

chip edge, it is at least as likely that the inventors were distinguishing the invention from the prior art wiring films because the films never extend along the sides of the chips—the prior art wiring films extend up and out, but never down. Thus, the inventors’ statement was not sufficiently clear to establish that a disclaimer occurred. *See Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1325 (Fed. Cir. 2003) (“To balance the importance of public notice and the right of patentees to seek broad patent coverage, we have thus consistently rejected prosecution statements too vague or ambiguous to qualify as a disavowal of claim scope.”).

For the foregoing reasons, this court affirms the Commission’s construction of the downwardly alongside limitation. Therefore, this court need not address Appellants’ argument that the accused packages do not infringe under their preferred construction.

C. Infringement

On the issue of infringement, the ALJ, in the *Initial Determination*, and the Commission, in the *Final Determination*, came to contradictory conclusions on several factual issues and the ultimate conclusion. Each party in this appeal, not surprisingly, argues that the opinion supporting its position is correct. However, “we do not ‘review’ the correctness of the ALJ’s initial decision or the correctness of the Commission’s ‘reversal.’” *Fischer & Porter Co., Inc. v. Int’l Trade Comm’n*, 831 F.2d 1574, 1577 (Fed. Cir. 1987). Instead, “19 U.S.C. § 1337(c), directs that on appeal to this court, this court must review the ‘final determination of the Commission . . . in accordance with chapter 7 of title 5 [i.e., the Administrative Procedure Act (APA)].’” *Id.* While the ALJ’s opinion may be probative, “this court may not substitute its judgment for the Commission’s final determination on the ground

that the court believes the ALJ's . . . view is 'more reasonable.'" *Id.* Under the APA, this court reviews the Commission's factual findings, such as its finding of infringement, for substantial evidence. *See* 5 U.S.C. § 706(2)(E); *Finnigan Corp. v. Int'l Trade Comm'n*, 180 F.3d 1354, 1361-62 (Fed. Cir. 1999).

1. Direct Infringement

To prove direct infringement, Tessera must establish by a preponderance of the evidence that "one or more claims of the patent read on the accused device literally or under the doctrine of equivalents." *Cross Med. Prods., Inc. v. Medtronic Sofamore Danek, Inc.*, 424 F.3d 1293, 1310 (Fed. Cir. 2005); *Enercon GmbH v. Int'l Trade Comm'n*, 151 F.3d 1376 (Fed. Cir. 1998). The arguments on this issue are extremely complex and highly technical. However, the dispute narrows to a single question of fact: whether the accused products meet the moveable limitation found in all the asserted claims of both the '326 and '419 patents. Appellants assert that Tessera failed to show, through its presentation of Dr. Qu's tests, that the accused products either practiced the claimed movement or that such movement caused appreciable stress relief. Tessera and the ITC respond that Dr. Qu's tests properly established substantial evidence of infringement.

Appellants cite with approval the ALJ's *Initial Determination* in which the ALJ found several problems with Dr. Qu's methodology and concluded that Tessera had failed to prove by a preponderance of the evidence that the accused products practice the claimed movement. First, the ALJ found that because Dr. Qu could not quantify the changes in internal behavior of the baseline package due to his substitutions of materials and their corresponding properties, such as coefficient of thermal expansion, Dr. Qu's Test 1 was ineffective at demonstrat-

ing that accused products practiced the claimed movement. *Initial Determination* at 61. Second, the ALJ found that Test 2 did not properly demonstrate what movement was due to external loads (i.e., claimed movement) because: (1) Dr. Qu did not quantify the margin or error inherent in his assumption of linearity; (2) Dr. Qu did not measure displacement at the terminals located on the bottom of the package (and at the top of the solder balls), but instead measured the displacement at the bottom of the solder balls; and (3) Test 2 did not show how much of the total displacement was due to “CTE matching” as opposed to external forces and therefore could not show appreciable stress relief. *Id.* at 63-66. Finally, the ALJ found that Dr. Qu did not appropriately validate his testing models, because his Moirè analysis was improperly performed over a narrower temperature range than the model it sought to validate. *Id.* at 67. In addition, since the Moirè testing could not distinguish claimed movement from other movement, the ALJ found that it could not provide any independent evidence of the presence of claimed movement. *Id.*

Tessera and the ITC, on the other hand, advocate the reasoning and conclusion found in the Commission’s *Final Determination*. The Commission agreed with the ALJ that Test 1 was defective because of Dr. Qu’s inability to determine how much movement was due to “CTE matching” and how much, if any, was due to external loads. *Final Determination* at 20. However, the Commission found that since the methodology in creating baseline packages was correct, the unquantified coefficient of thermal expansion behavior of the baseline package only affected the usefulness of Test 1. In particular, the Commission pointed out that during Test 2, thermal cycling was only applied to the accused packages in order to determine the difference between the on-board and off-

board displacement vectors. Since the resulting displacement was applied directly to the baseline packages without any further thermal cycling, the Commission stated that “any consideration of the differences in the [coefficient of thermal expansion] behavior of the accused and baseline packages [was] completely irrelevant.” *Id.* at 46. The Commission found the ALJ’s criticism of Test 2 misplaced because Appellants’ expert, Dr. Sitaraman, “acknowledged the appropriateness of using the linearity assumption to determine displacement due to only external loads in his own modeling.” *Id.* at 39. In fact, the Commission observed that “there is no evidentiary support for the [ALJ’s] conclusion that the linearity assumption is inherently flawed.” *Id.* at 40. Thus, unlike the ALJ, the Commission concluded that Dr. Qu’s Test 2 adequately showed that the accused products infringed the asserted claims of the ’326 and ’419 patents. *Id.* at 15. Finally, the Commission decided that it was unnecessary to validate the modeling tests with the Moirè test, but agreed with Dr. Qu that the Moirè results provided additional evidence that the inputs used for Test 2, and therefore the methodology of Test 2, were accurate. *Id.* at 21-29.

Appellants’ numerous arguments on this issue can be summarized as follows: (1) the 52 representative models chosen by Dr. Qu were not sufficient to show that all accused products infringed; (2) Dr. Qu’s Test 2 was technically flawed and the Commission improperly went beyond the expert testimony to find that Test 2 was sufficient evidence of infringement; and (3) the Moirè test did not supply the required validation of Test 2. This court is not persuaded by any of these arguments. Because this court agrees with the Commission that Dr. Qu’s Test 2 provided substantial evidence of infringement, this

court need not address Tessera’s further argument that the Commission erred in rejecting Dr. Qu’s Test 1.

First, Appellants argue that Tessera did not properly show by a preponderance of the evidence that Dr. Qu’s 52 chosen models were representative of all the accused products. The ALJ found otherwise, stating “the ALJ finds Dr. Qu’s approach in selecting representative accused products reasonable and well thought out. By selecting representative products that span the range of values for those parameters that most directly affect the claimed movement, Dr. Qu has offered specific and substantial evidence as to why those accused products not selected by Dr. Qu can reasonably be expected to behave like the representative accused products.” *Initial Determination* at 57. In fact, the ALJ found that “[e]ven Respondents’ expert Dr. Sitaraman acknowledged that the accused devices were similar in structure” and thus a representative analysis of the accused products was appropriate. *Id.* at 55. The Commission did not review the ALJ’s findings on this issue and adopted the ALJ’s conclusions as its own. This court agrees that substantial evidence supports the ALJ’s finding that the modeled and non-modeled products operate similarly with respect to the claimed limitation. *See TiVo, Inc. v. EchoStar Comm. Corp.*, 516 F.3d 1290, 1308 (Fed. Cir. 2008) *rehearing en banc granted*, 376 Fed. App’x 21 (Fed. Cir. May 14, 2010). Dr. Qu provided detailed evidence describing his selection process, which was based on criteria that would most directly affect relative terminal displacement. *See, e.g.*, JA55172 ¶ 454 (Supp. Witness Statement of Dr. Jianmin Qu CsX-3669C) (stating that he “selected products to model based on parameters [he] felt were particularly important to the analysis, which included the type of package – single or multi-chip – as well as die size, ball pitch, and the modulus of the die attach materials”). And

Dr. Qu stated that “by select[ing] packages that have values of those parameters that are at or near the extremes among the pool of accused products” the chosen representative packages were “fairly representative of the entire pool of accused products.” *Id.* ¶ 455. Appellants contend that the ALJ improperly shifted the burden to Appellants to establish that the non-modeled accused packages would behave differently than those that were modeled. Rather than improper burden shifting, the ALJ properly found that Appellants simply failed to rebut the substantial evidence set forth by Tessera. *Initial Determination* at 56-57.

Second, Appellants assert that Test 2 was technically flawed. Appellants reiterate each of the arguments made both to the ALJ and the Commission on this issue. Appellants argue that Test 2 cannot be relied upon because, among other things: (1) loads were applied to the bottom of the solder balls instead of at the top; (2) the Commission improperly assumed that all observed stress relief was attributed to claimed movement; (3) the linearity assumption was a fatal defect in Test 2; and (4) Test 2 was inherently unreliable because it was used only by Dr. Qu for the purpose of legal proceedings. This court is not persuaded by these arguments. The Commission explicitly acknowledged that in Test 2 the load was applied to the bottom of the solder balls, and that displacement at the bottom of the solder balls was not equivalent to displacement at the top of the solder balls due to solder deformation. However, the Commission found that this was not fatal to the effectiveness of Test 2 because “it is in fact, the displacement differential between the package and the PCB that causes the ‘mechanical stress.’” *Final Determination* at 42. Thus, since it was “undisputed that the PCB applies all of its force to the bottom of the solder ball,” the Commission found that “Dr. Qu properly simu-

lated the external load being applied to the packages by determining displacement at the bottom of the solder balls, at least some of which is transferred to the terminals.” *Id.* This conclusion, based on witness testimony, was not unreasonable.

Furthermore, the Commission reasonably determined, based on expert evidence, that Test 2 showed claimed movement, which resulted in the relief of stresses that would not have been present in the absence of the claimed movement. Because the claim construction did not require quantifying the amount of external load, Qu’s linearity approximation was sufficient to show infringement, and the Commission properly relied on expert testimony supporting this conclusion. Finally, the Commission thoroughly analyzed the expert evidence and found that Test 2, based on industry-accepted modeling, was reliable evidence of infringement. This conclusion is not invalidated simply because the model was specifically tailored to the unique claim construction at issue. This court has considered and found unpersuasive Appellants’ remaining arguments that Test 2 was technically flawed.

Citing *Centricut, LLC v. The ESAB Group, Inc.*, 390 F.3d 1361 (Fed. Cir. 2004), Appellants also assert that the Commission improperly went beyond the expert testimony, instead adding its own interpretation to the raw data from Dr. Qu’s tests. *Centricut* is inapplicable here. This court held in *Centricut* that “in a case involving complex technology, where the accused infringer offers expert testimony negating infringement, the patentee cannot satisfy its burden of proof by relying only on testimony from those who are admittedly not expert in the field.” 390 F.3d at 1370. In this case, however, both sides presented relevant expert testimony on the technical aspects of Dr. Qu’s tests. The Commission was entitled to resolve the conflicting evidence in favor of a finding of

infringement. *See Bio Tech. Gen. Corp. v. Genentech, Inc.*, 267 F.3d 1325, 1330-31 (Fed. Cir. 2001) (“When scientific certainty is not available, and the scientific theories and evidence are within a reasonable range of difference of scientific opinion, resolution of such difference based on weight and credibility of evidence is the province of the trier of fact.”).

In addition, Appellants contend that it was improper for the Commission to rely on Test 2 as independent evidence of infringement because Dr. Qu himself testified that he merely used the results of Test 2 to confirm the results of Test 1. However, the Commission specifically noted that “Dr. Qu clearly states that he believes the results of his second testing method show that the accused packages meet the claimed ‘movement’ limitation, and thus show infringement.” *Final Determination* at 50 n.8. Given Dr. Qu’s testimony, it was not incorrect for the Commission to rely on Test 2 as independent evidence of infringement.

Third, Appellants argue that Dr. Qu’s modeling required physical validation by Moirè testing. According to Appellants, the Commission’s infringement findings should be rejected because Moirè testing was done only on a subset of temperatures and thus Test 2 was not properly validated over the entire range of temperatures. However, Tessera’s burden to show infringement by a preponderance of the evidence does not require physical validation of all indirect evidence. *See Alza Corp. v. Mylan Labs., Inc.*, 464 F.3d 1286, 1296 (Fed. Cir. 2006) (“The critical deficiency in the evidence presented by Alza was not that it was ‘indirect’ rather than ‘direct’ . . . ”). The Commission concluded that, based on the evidence, validation of Test 2 was not necessary. However, even if it were necessary, the Commission found that the Moirè testing did validate Test 2 over the entire temperature

range. *Final Determination* at 29. The Commission properly based this finding on evidence in the record, pointing out that Appellants' own expert, Dr. Sitaraman, testified that the model is generally correct when the inputs to the model are correct and that Moirè testing on a limited sample can validate the overall modeling methodology. *Final Determination* at 23, 25-26. The Commission and ALJ also agreed that while some discrepancies were apparent in the results, the Moirè analysis generally correlated with the results of Test 2. *Initial Determination* at 67; *Final Determination* at 22-23. This court agrees that there was substantial evidence for the Commission's finding that Dr. Qu's Moirè testing properly validated the results of Test 2.

2. Contributory Infringement

Tessera admits that Appellants' accused standalone packages cannot directly infringe the '419 patent because the standalone packages are not mounted on printed circuit boards, as required by the claims. Thus, those accused packages can only infringe indirectly. In his *Initial Determination*, the ALJ found that Tessera waived any argument that the accused products indirectly infringe the asserted patents. *Initial Determination* at 69. On review, the Commission reversed the finding of waiver because the commission investigative attorney preserved the issue in his post-hearing brief. *Final Determination* at 52. On the merits, the Commission found that Appellants contributed to direct infringement of the asserted claims of the '419 patent under 35 U.S.C. § 271(c) by selling a component of the directly infringing devices. *Id.*

"Under 35 U.S.C. § 271(c), a party who sells a component with knowledge that the component is especially designed for use in a patented invention, and is not a staple article of commerce suitable for substantial nonin-

fringing use, is liable as a contributory infringer.” *Wordtech Sys., Inc. v. Integrated Networks Solutions, Inc.*, 609 F.3d 1308, 1316 (Fed. Cir. 2010). Thus, to prevail on contributory infringement in a Section 337 case, the complainant must show: (1) there is an act of direct infringement in violation of Section 337; (2) the accused device has no substantial non-infringing uses; and (3) the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another’s direct infringement. See 19 U.S.C. § 1337(a)(1)(B); *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1303 (Fed. Cir. 2006). The nature of the accused device at issue may be important to the analysis of whether a substantial non-infringing use exists. See *Ricoh Co., Ltd. v. Quanta Computer Inc.*, 550 F.3d 1325, 1337 (Fed. Cir. 2008) (stating that an accused infringer “should not be permitted to escape liability as a contributory infringer merely by embedding [the infringing product] in a larger product with some additional, separable feature”).

The Commission found that Tessera had shown all three elements necessary for a finding of contributory infringement. First, the Commission found that “the evidence shows that Motorola incorporates the accused devices into its products” and thus directly infringes the ’419 patent. *Final Determination* at 53. Second, the Commission stated that “[t]here is no dispute that the accused products have been imported, sold for importation, or sold after importation in the United States by or on behalf [of] all of the Respondents.” *Id.* at 54-55. Third, the Commission found that Tessera successfully made a *prima facie* showing that the accused packages did not have any substantial non-infringing uses with evidence that Respondents instruct their customers to connect the accused packages to PCBs using solder. *Id.* at 55 (citing

Golden Blount, Inc. v. Robert H. Peterson Co., 438 F.3d 1354, 1363 (Fed. Cir. 2006)). The Commission further found that Appellants did not successfully rebut this showing. *Id.* at 57-58. The Commission acknowledged Appellants' arguments that the accused packages have substantial non-infringing uses because they can be mounted using underfill or sockets to restrict or prevent the claimed movement. *Id.* However, the Commission found that Appellants presented only a small amount of evidence showing that Appellants' customers have actually used underfill or sockets for mounting accused packages and this was not enough to overcome Tessera's prima facie case. *Id.* at 58.

Appellants argue that each of these findings by the Commission is erroneous. First, Appellants argue that because Motorola subsequently signed a license agreement specifically authorizing use of the accused packages, this court must vacate all of the Commissions findings concerning the '419 patent and the resulting orders as moot and remand to the ITC. This court does not agree. While the Commission's decision specifically mentioned only Motorola by name, the Commission specifically considered evidence of direct infringement by additional customers. *See, e.g., Final Determination* at 55-58 (referring repeatedly to more than one customer when describing the evidence supporting the finding of contributory infringement). Additionally, as the ITC points out, to the extent Appellants believe the remedial orders should be modified to reflect changed circumstances, they can seek modification of the Commission order from the ITC. This court has also considered, but does not find persuasive, Appellants' arguments that there was not substantial evidence on the record to show that Motorola directly infringed.

Second, Appellants argue that the evidence showed the accused products can be mounted onto a printed circuit board with either underfill or sockets, that such mounting is “common,” and that such uses are non-infringing. In particular, Qualcomm argues that the Commission disregarded its evidence of substantial non-infringing use based on a misreading of *Ricoh*. Qualcomm’s Principal Br. at 53. While the Commission did cite to *Ricoh*, it did so in the context of merely defining the scope of the accused device in order to determine whether substantial non-infringing uses exist. *Final Determination* at 56 (“The question here, therefore, is just what is the accused device in question and whether it alone, has any substantially non-infringing uses.”) The Commission then properly concluded that “with respect to the ’419 patent, the accused device must be the combination of a PCB and a face-up BGA package with at least one solder ball for mounting upon the PCB, where the BGA package is capable of exhibiting the claimed ‘movement.’” *Id.* at 57. Moreover, the Commission acknowledged Appellants’ evidence on this issue, but found that most of that evidence was in the form of general assertions that underfill and sockets were commonly used in the 1990s. *Id.* at 57-58. Noting that “[o]nly Qualcomm . . . has produced any evidence that its customers have actually used underfill in mounting Qualcomm’s accused chip packages,” the Commission found that “this evidence [wa]s not enough to overcome Tessera’s showing that the accused device, which consists of an accused BGA package, a PCB, and solder balls connecting the accused BGA package to the PCB, has no substantial non-infringing use in and of itself.” *Id.* at 58. This court agrees with the Commission that Tessera made a *prima facie* showing as to the absence of any substantial non-infringing uses and that Appellants’ evidence was insufficient to overcome that showing. See *Golden Blount*, 438 F.3d at 1363-64

(stating “it matters not that the assembled device can be manipulated into a non-infringing configuration, because the instructions packaged with each device teach the infringing configuration” and thus “[t]he burden of production then shifted to [the accused infringer] to introduce some evidence that end-users actually assembled the [accused devices] in a non-infringing way”).

Third, STMicro argues that there is no evidence that any of its alleged acts of contributory infringement had the requisite connection with the United States because only 47 of the accused packages were sold or offered for sale in the United States by STMicro and those packages were purchased under a license from Tessera to STMicro-electronics, Inc. (“ST-Inc.”), STMicro’s domestic subsidiary. *Final Determination* at 55 n.11. However, both the Commission and the ALJ found that STMicro did not prove that any of its other accused products were covered by the Tessera license, that STMicro “admit[ted] that 14 accused products, which were not sold through ST-Inc., have been imported into the United States in downstream products,” and that “Tessera has proven by a preponderance of the evidence that those products are incorporated into finished downstream products that are imported, sold for importation, or sold after importation into the United States.” *Id.*; *Initial Determination* at 109-10. This court agrees with the Commission that the record contained substantial evidence showing that STMicro sold for importation into the United States accused packages that contributed to direct infringement of the ’419 patent.

Finally, Appellants assert that the Commission erred in finding contributory infringement without properly finding the requisite knowledge. The Commission addressed intent in the context of induced infringement under 35 U.S.C. § 271(b) and found that Tessera did not meet its burden to show that Appellants “had the neces-

sary intent to support a finding of infringement by inducement.” *Final Determination* at 54. However, because license negotiations indicated that Appellants were aware of the ’419 patent, and Tessera successfully showed that the accused devices did not have any substantial non-infringing uses, the Commission presumed the requisite knowledge for contributory infringement. *Id.* This conclusion was not erroneous. See *Metro-Goldwyn-Mayer Studios, Inc. v. Grokster, Ltd.*, 545 U.S. 913, 932 (2005) (“One who makes and sells articles which are only adapted to be used in a patented combination will be presumed to intend the natural consequences of his acts; he will be presumed to intend that they shall be used in the combination of the patent.” (internal quotation marks omitted)); *Ricoh*, 550 F.3d at 1343 (“*Grokster* recognized that providing instruction on how to engage in an infringing use ‘show[s] an affirmative intent that the product be used to infringe.’” (quoting *Grokster*, 545 U.S. at 936)); *DSU*, 471 F.3d at 1303 (“even beyond the minimal intent requirement for contributory infringement, ITL acted with the knowledge of the [asserted] patent . . .”).

D. Anticipation

Several Appellants appeal the Commission’s finding that two prior patents, U.S. Patent No. 5,241,133 (the “Mullen patent”) and the Lin patent, did not anticipate Tessera’s asserted claims. A patent may be found invalid as anticipated under 35 U.S.C. § 102(e) if “the invention was described in . . . a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent.” A claim is anticipated when “the four corners of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation.” *Advanced Display Sys.,*

Inc. v. Kent State Univ., 212 F.3d 1272, 1282 (Fed. Cir. 2000). A reference patent anticipates an invention under § 102(e) only if the reference patent's effective filing date is before the date of the invention. *See In re Matthews*, 408 F.2d 1393 (CCPA 1969).

Appellants argue that the Commission erroneously found that the inventions of the '326 and '419 patents were conceived in June 1990, several months before the Lin and Mullen patents were filed. “Conception is the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention, as it is therefore to be applied in practice.” *Singh v. Brake*, 317 F.3d 1334, 1340 (Fed. Cir. 2003) (internal quotation marks omitted). An idea is sufficiently definite for conception “when the inventor has a specific, settled idea, a particular solution to the problem at hand, not just a general goal or research plan he hopes to pursue.” *Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994). However, a finding of conception does not require perfection: conception is complete when “the idea is so clearly defined in the inventor’s mind that only ordinary skill would be necessary to reduce the invention to practice, without extensive research or experimentation.” *Id.* Because it is a mental act, an inventor’s oral testimony regarding conception must be corroborated by “evidence which shows that the inventor disclosed to others his completed thought expressed in such clear terms as to enable those skilled in the art to make the invention.” *Coleman v. Dines*, 754 F.2d 353, 359 (Fed. Cir. 1985) (internal quotation marks omitted). Conception may be corroborated even if no single piece of evidence shows complete conception. *Price v. Symsek*, 988 F.2d 1187, 1196 (Fed. Cir. 1993). Instead, all of the evidence of record must be collectively evaluated in determining when the invention was conceived. *Id.* The

issue of conception is a question of law based on underlying factual findings. *Singh*, 317 F.3d at 1340. Accordingly, this court reviews *de novo* the Commission's legal conclusions with respect to conception, and reviews the underlying factual findings by the Commission for substantial evidence. *Id.*

The ALJ found that neither the Mullen nor the Lin patent anticipated Tessera's patents because they were not prior art under 35 U.S.C. § 102(e). The effective filing date of the Mullen patent was December 21, 1990 and that of the Lin patent was December 4, 1990. The ALJ determined that the date of invention accorded the asserted claims of the '326 and '419 patents was June 10, 1990, several months prior to the filing dates of the Mullen and Lin patents. *Initial Determination* at 88-89. The ALJ based this determination partly on testimony by Dr. DiStefano, one of the inventors of the '326 and '419 patents, stating that he and another inventor, Dr. Khandros, conceived the ideas included in the asserted claims in early June 1990. *Id.* at 73-74. The ALJ found that Dr. Bottoms, a non-inventor involved in the work of DiStefano and Khandros, corroborated DiStefano's testimony. *Id.* at 74. The ALJ also found that engineering notebook entries corroborated the testimony of Bottoms and DiStefano. Based on these factual findings, the ALJ concluded that "as of June 1990 inventors DiStefano and Khandros had conceived of the inventions embodied in the asserted claims of the '326 and '419 patents such that only ordinary skill would be necessary to reduce the invention to practice." *Id.* at 77. The ALJ further found that DiStefano and Khandros acted with due diligence in reducing their conceived invention to practice from conception to the filing of the '265 patent application, from which the '326 and '419 patents claim priority. *Id.* at 78.

Appellants argue that the Commission erred in finding a June 1990 conception date for the asserted claims. Specifically, Appellants argue that the ALJ misinterpreted the testimony of DiStefano and Bottoms and the engineering notebooks. Appellants assert that conception of the asserted claims occurred no earlier than January 1991—after the effective filing dates of the Mullen and Lin patents. First, Appellants argue that the testimony noted by the ALJ showed that the inventors had only a general goal or research plan that they hoped to pursue, not a specific settled idea. In addition, Appellants assert that several key aspects of the asserted claims were missing from the invention on June 1990. Next, Appellants argue that there was no evidence corroborating the testimony of DiStefano and Bottoms and that the ALJ erroneously focused on a single June 10, 1990, notebook entry that was simply an anomalous entry unrelated to conception of the asserted claims. Instead, Appellants assert that the notebooks demonstrate a “steady evolution of ideas concerning face-down chips from May 1990 until January 1991.” STMicro’s Principal Br. at 59.

This court is not persuaded by Appellants’ arguments that the Commission misconstrued the testimony and documentary evidence before it. The *Initial Determination* thoroughly describes the testimony of DiStefano and Bottoms and analyzes several entries of the engineering notebooks beginning in May 1990 and ending June 10, 1990, detailing how they record the development of all aspects of the invention, including the face-up configuration of the chip. *Id.* at 75-76. The Commission credited inventor DiStefano’s trial testimony that the initial concept of a face-up chip assembly having the claimed elements was conceived in early June 1990. After a review of the record evidence in light of the proper legal standards, this court concludes that the Commission did

not err in finding a June 1990 conception date. Thus, this court affirms the Commission's determination that the '326 and '419 patents are not anticipated by the Mullen or Lin patents.

E. Injunctive Relief

Spansion argues that even if Appellants were liable for infringement, the Commission's award of prospective injunctive relief should be vacated because the Commission failed to give meaningful consideration to the public interest consequences of the injunction. In particular, Spansion argues that the public interest inquiry in this context is similar to the traditional test for injunctive relief that district courts apply under *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006). According to Spansion, the Commission, in keeping with *eBay*, should have considered the following equitable factors: (1) the PTO rejected some of the asserted claims as unpatentable in the reexamination; and (2) Tessera could be made whole by damages because Tessera is simply a licensor and does not actually practice the invention. The ITC responds that the Commission properly considered the public interest factors prior to issuing the exclusion order and that *eBay* does not apply to Commission remedy determinations.

This court reviews the Commission's action in awarding injunctive relief as to whether it is arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law. *See, e.g., Epistar Corp. v. Int'l Trade Comm'n*, 566 F.3d 1321, 1333 (Fed. Cir. 2009). In this case, the Commission issued its limited exclusion order after finding that "there are no public health and safety concerns since Tessera has chosen not to seek exclusion of two-way radios imported for use by first responders." *Final Determination* at 74. The Commission discussed

the statutorily mandated public interest factors of “competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers” by stating that “there are multiple, licensed sources for semiconductor chips with minimized chip package size” and “there is no evidence that Tessera’s licensees would be unable to adequately supply the United States market if Respondents’ products were excluded.” *Id.* The Commission added that “the office action reflecting the rejection is not final. Such adverse office actions in the reexamination process are fairly routine and are not an indication that the patent claims are necessarily going to be finally rejected. Although a final rejection has been issued against the asserted claims of the ’419 patent and prosecution has been closed in that reexamination proceeding, it would be premature to give undue weight to the reexamination proceedings until or unless Tessera has exhausted its appeals.” *Id.* at 76.

By statute, the Commission is required to issue an exclusion order upon the finding of a Section 337 violation absent a finding that the effects of one of the statutorily-enumerated public interest factors counsel otherwise. 19 U.S.C. § 1337(d)(1) (“If the Commission determines, as a result of an investigation under this section, that there is a violation of this section, it *shall* direct that the articles concerned, imported by any person violating the provision of this section, be excluded from entry into the United States, *unless*, after considering the effect of such exclusion upon the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers, it finds that such articles should not be excluded from entry.”) (emphases added). The enumerated public interest factors include:

(1) the public health and welfare; (2) competitive conditions in the United States economy; (3) the production of like or directly competitive articles in the United States; and (4) United States consumers. *Id.*

The legislative history of the amendments to Section 337 indicates that Congress intended injunctive relief to be the normal remedy for a Section 337 violation and that a showing of irreparable harm is not required to receive such injunctive relief. This is shown by two distinct actions of Congress. First, in passing the Tariff Act of 1930, Pub. L. No. 71-361, 46 Stat. 590, Congress eliminated the monetary remedy for intellectual property import violations, representing a legislative determination that an injunction is the only available remedy for violations of Section 337. Second, in 1988, Congress amended Section 337 by passing the Omnibus Trade and Competitiveness Act of 1988, Pub. L. No. 100-418, 102 Stat. 1107, explicitly removing the requirement of proof of injury to the domestic industry and making it unnecessary to show irreparable harm to the patentee in the case of infringement by importation. *See H.R. Rep. No. 100-576, at 633 (1988) (Conf. Rep.)* (stating that the bill “removes the requirement to prove injury . . . with regard to certain intellectual property rights cases involving patents”); *S. Rep. No. 100-71, at 128 (1987)* (“The fundamental purpose of the amendments made by section 401 is to strengthen the effectiveness of section 337 in addressing the growing problems being faced by U.S. companies from the importation of articles which infringe U.S. intellectual property rights.”); *id. at 129* (“The Committee does not intend that the ITC, in considering the public health and welfare, or the President, in reviewing the ITC’s determination on policy grounds, will reintroduce these requirements.”); *accord H.R. Rep. 100-40 at 156 (1987)*.

As contrasted with the remedial scheme established by Congress for proceedings before the Commission, the statutory remedies available in proceedings before the district courts are quite different. In addition to the remedy of damages under 35 U.S.C. § 284, Congress gave district courts the discretion to grant injunctive relief and in doing so made explicit that such discretion is to be exercised “in accordance with the principles of equity . . . on such terms as the court deems reasonable.” 35 U.S.C. § 283. In *eBay*, the Supreme Court explained that Section 283 did not endorse or establish a categorical grant of injunctive relief following a determination of infringement. Rather, the decision whether to grant or deny injunctive relief under Section 283 depends on traditional principles of equity, applying the four-part test for permanent injunctive relief in patent disputes no less than in other cases governed by such standards. *See eBay*, 547 U.S. at 391 (discussing the four-factor test for injunctive relief).

Given the different statutory underpinnings for relief before the Commission in Section 337 actions and before the district courts in suits for patent infringement, this court holds that *eBay* does not apply to Commission remedy determinations under Section 337. The Commission is not required to apply the traditional four-factor test for injunctive relief used by district courts when deciding whether to issue the equitable remedy of a permanent injunction. Unlike the equitable concerns at issue in *eBay*, the Commission’s issuance of an exclusion order is based on the statutory criteria set forth in Section 337. Spansion’s argument that the term “public welfare” is so “broad and inclusive” that Congress must have intended it to include the traditional equitable principles reflected in the *eBay* standard is unpersuasive when viewed in the context of Section 337. The scope of the

public interest factors recited in Section 337 is a matter of statutory interpretation not necessarily informed by the same principles of equity relevant to the grant of permanent injunctive relief under 35 U.S.C. § 283.

The difference between exclusion orders granted under Section 337 and injunctions granted under the Patent Act, 35 U.S.C. § 283, follows “the long-standing principle that importation is treated differently than domestic activity.” *In the Matter of Certain Baseband Processor Chips and Chipsets, Transmitter and Receiver (Radio) Chips, Power Control Chips, and Products Containing Same, Including Cellular Telephone Handsets*, Inv. No. 337-TA-543, 2007 ITC Lexis 621, *102 n.230 (U.S.I.T.C. June 19, 2007) (citing *United States v. 12 200-ft. Reels of Film*, 413 U.S. 123, 125 (1973)). This is reflected in the fact that the Commission has found public interest considerations to outweigh the need for injunctive relief in protecting intellectual property rights found to have been violated under Section 337 in only three investigations, all of which were decided prior to the 1988 legislative amendment discussed above, which removed the requirement that a patentee show irreparable harm. See *id.*, 2007 ITC Lexis 621 at *220. Moreover, in those three cases, the exclusion order was denied because inadequate supply within the United States—by both the patentee and domestic licensees—meant that an exclusion order would deprive the public of products necessary for some important health or welfare need: energy efficient automobiles, basic scientific research, or hospital equipment. See *In the Matter of Certain Fluidized Supporting Apparatus and Components*, Inv. No. 337-TA-182/188, USITC Pub. 1667 (Oct. 1984); *In the Matter of Inclined Field Acceleration Tubes and Components*, Inv. Nos. 337-TA-60, USITC Pub. 1119 (Dec. 1980); *In the Matter of Certain*

Automatic Crankpin Grinders, Inv. No. 337-TA-60, USITC Pub. 1022 (Dec. 1979).

With respect to the ongoing PTO reexamination, such proceeding is not explicitly listed as a public interest factor in Section 337. The Commission nevertheless discussed the ongoing reexamination of the patents at issue in its *Final Determination* and again in response to Appellants motion for a stay. The Commission found that it would be premature to give dispositive weight to the PTO reexamination proceedings until all appeals had been exhausted. *In re Certain Semiconductor Chips with Minimized Chip Package Size and Products Containing Same*, No. 337-TA-605, slip op. at 11-12 (Int'l Trade Comm'n May 27, 2008). Thus, while it is not accurate to say that “the Commission gave the reexaminations no weight at all,” Spansion’s Reply Br. at 23, it was not erroneous for the Commission to omit any discussion of such issues from its analysis of the public interest factors when fashioning a remedy to Appellants’ violation of Section 337.

Based on the foregoing, this court finds that the Commission provided a sufficient basis for issuance of the limited exclusion order and that its actions were not arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.

CONCLUSION

Because the Commission’s decision was supported by substantial evidence and contained no errors of law, this court affirms the *Final Determination* in all respects.

AFFIRMED