

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

HARBOR ISLAND DYNAMIC, LLC,
Patent Owner.

IPR2024-01404
Patent 9,147,609 B2

Record of Oral Hearing
Held: January 7, 2026

Before HYUN J. JUNG, GREGG I. ANDERSON, and
ARTHUR M. PESLAK, *Administrative Patent Judges*.

APPEARANCES:

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P R O C E E D I N G S

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3:21 p.m.

JUDGE JUNG: All right, this is the oral argument for IPR 2024-01404. Petitioner Samsung challenges all claims of U.S. Patent No. 9,147,609, owned by Harbor Island Dynamic. Starting with Petitioner, followed by Patent Owner's counsel, please state your names for the record.

MR. GOLDBERG: Good afternoon, Your Honor. Joshua Goldberg for Petitioner Samsung. With me, I have my colleague Abhay Watwe.

JUDGE JUNG: Thank you.

MR. MERCADANTE: For Harbor Island, Joseph Mercadante from Fabricant LLP.

JUDGE JUNG: Thank you. Mr. Goldberg, you may proceed whenever you're ready. How much time would you like to reserve for rebuttal?

MR. GOLDBERG: I'll reserve 20 minutes, Your Honor.

JUDGE JUNG: All right.

MR. GOLDBERG: Let's start with slide 2.

JUDGE JUNG: All right. Mr. Goldberg, before you start with your prepared remarks, I'd like to just have a conversation about your 102 challenge based on Cooney and then the 103 challenge based on Cooney. First, we'll start with the disclosure of Cooney. And you relied on the figures, in particular 6 and 10 of Cooney, but those figures are one of a series of figures showing progressive steps in Cooney's process. So just to confirm, are you relying on an embodiment where in Figure 10, the last step, void 25 is still there?

1 MR. GOLDBERG: Yes.

2 JUDGE JUNG: Okay. I did not see -- although Figure 10 shows that
3 void 25 is gone by that step, what's your basis for extrapolating that void 25
4 is still there by the time it reaches the step of Figure 10?

5 MR. GOLDBERG: I think, Your Honor, the confusion arises because
6 the void is optional and it is described as optional and shown in one of the
7 figures, but then they don't break off and say, and here's all the steps if you
8 have the void and here's all the steps if you don't have the void. They just
9 proceed and show it if you didn't have the void. That's what's creating
10 confusion, but it would still be there.

11 JUDGE JUNG: Okay. Now, I didn't -- that's a reasonable
12 extrapolation to make based on certain statements in Cooney itself, and I see
13 Dr. Thompson cites the same statements that I've looked at to draw that
14 extrapolation from. But Dr. Thompson actually never comes out and says,
15 in my opinion, void 25 would still be there in Figure 10. Is there elsewhere
16 maybe where he brings up and addresses that exact point?

17 MR. GOLDBERG: I'm not sure, Your Honor. Let me ask my co-
18 counsel to look at that and we'll get back to you later on it.

19 JUDGE JUNG: All right. Now, if you can bring up, I'd like to
20 discuss your Petition, the '609 patent, and Dr. Thompson's first declaration.
21 So if you have those handy in front of you, just let me know.

22 MR. GOLDBERG: Yes, just give me one second, Your Honor.
23 Okay.

24 JUDGE JUNG: I'd like you to go to page 20 of your Petition.

25 MR. GOLDBERG: Yes.

1 JUDGE JUNG: And that first full paragraph is what I want to discuss,
2 and this is the paragraph where you assert that the phrase “to reduce thermal
3 stress in said semiconductor substrate” should be entitled to no patentable
4 weight.

5 MR. GOLDBERG: Yes, sir.

6 JUDGE JUNG: And for support, you have some case law. And then
7 at the very bottom, at the end of this paragraph, you have a second-to-last
8 sentence. Other than disclosing the presence of a hollow center in the TSV
9 or the through-silicon via, the '609 patent does not identify any features of
10 the hollow center that contributes to thermal stress reduction in the
11 semiconductor substrate. And then you cite generally the '609 patent and
12 then paragraph 123 of the Thompson declaration. Do you see that?

13 MR. GOLDBERG: Yes, Your Honor.

14 JUDGE JUNG: Okay. So is your position that this phrase requires no
15 -- should be entitled to no patentable weight based on the case law and then
16 that there is no disclosure about that hollow center other than it's there?

17 MR. GOLDBERG: Yes, Your Honor, and the reason for that way of
18 looking at things is that sometimes you can have a situation where there is
19 an expression of a result of a feature that then drives the way that the
20 structure needs to be constructed in order to achieve that result.

21 JUDGE JUNG: Okay.

22 MR. GOLDBERG: And in this situation here, Samsung's position,
23 our position, is that the mere fact that a void exists, that gets you the result of
24 reducing stress. And therefore, there doesn't need to be anything further
25 proven to say, well, this void reduces stress and that one doesn't because all
26 voids reduce stress.

1 And this is entirely consistent with the '609 patent's discussion
2 because if the '609 patent was going to take the view that there needed to be
3 some special type of structure beyond just the fact that void existed, then
4 you'd think it would have gone into an explanation of what is that exact size
5 and shape and whatnot. But it doesn't do that.

6 JUDGE JUNG: Okay. So I want to examine that last statement you
7 made. And here, I want you to turn to column 4 of the '609 patent, line 60
8 to 67.

9 MR. GOLDBERG: Just give me one second, Your Honor. You said
10 column 4?

11 JUDGE JUNG: Column 4, yes. Towards the bottom, starting at line
12 60, we have a description of what this hollow center portion does. It
13 provides many beneficial features. For instance, the hollow center portion
14 432 may serve to reduce intrinsic inductance of the TSV 402, and it also
15 reduces thermal and mechanical stress in the substrate by providing space
16 for conductive fillet 430 to expand inward rather than outward in high
17 temperature conditions.

18 When I read that, it does seem like there is additional disclosure in the
19 '609 patent that would undermine your assertion that the '609 patent does
20 not identify any features that contribute to thermal stress reduction in the
21 semiconductor substrate. Because it says it provides space for the specific
22 purpose of that conductive filler 430 to expand inward rather than outward.

23 And then I looked at your testimonial evidence, and Dr. Thompson, he
24 does address this portion, but he only addresses line 60 to 61. There's no
25 opinion or testimony for the rest of that paragraph. So if you look at, I think
26 it's paragraph 123 of the Thompson declaration.

1 MR. GOLDBERG: Yes, Your Honor. So first I'll just note that he
2 specifically calls out lines 60 and 61, but he also does follow it up with a
3 general cite to Exhibit 1001. And on the point that Your Honor is making
4 about this specific discussion in column 4, even there, I guess what I'm --
5 the way that I'm reading this is there's a void, and that makes it so that
6 there's space. But all voids would provide space for something to go into.
7 That's by definition what a void is. It's the lack of stuff so other stuff can go
8 into it.

9 JUDGE JUNG: But the remainder of that sentence, yes, it's a space
10 to allow the conductive filler to expand into, right? So that seems to be an
11 attempt to identify a feature that contributes to thermal stress reduction in
12 the '609 patent.

13 MR. GOLDBERG: So, Your Honor, I would just view that as
14 essentially a tautology that you have a void, and that creates space for
15 something to go, and that reduces stress. But in all of the evidence that's
16 been cited in this case and all of the different documents, including those
17 provided by Patent Owner, that is what happens. You have a void, and that
18 provides space for something to expand. You have a different coefficient of
19 thermal expansion that's created by the void that makes it so that there's
20 room for things to expand.

21 So I would think about this statement in the '609 patent that you're
22 identifying not as an expression of specifics on a particular structure, but
23 again, just a further, this is just the intended purpose. So you have the
24 ultimate intended purpose is to reduce stress, and that is accomplished by
25 this other purpose of you having some space for something to expand. But
26 structurally, it all comes back to the same thing, which is there's either a

1 void or there's not a void. And the mere presence of a void is what flows
2 and makes all these other things happen.

3 JUDGE JUNG: Okay. I understand your position. But to phrase it a
4 different way, it seems like there might be insufficient support for this
5 statement, because if I look at paragraph 123, Dr. Thompson just looks at
6 lines 60 and 61 and then says generally 101, but then there's really no
7 opinion about the rest of that paragraph. For example, what you just stated
8 is not explicitly made clear by paragraph 123 of Dr. Thompson's
9 declaration.

10 So if we believe that there is some features being identified in the
11 '609 patent, does the case law by itself come to the same conclusion that the
12 phrase "to reduce thermal stress in said semiconductor substrate" is entitled
13 to no patentable weight? Or do you need both, the case law and this
14 assertion that there's no identified features? Can you just stand on your case
15 law?

16 MR. GOLDBERG: I think we can, Your Honor. And one reason that
17 I think we can do that in this particular case is that Patent Owner itself, they
18 actually admitted, and I'm just looking for the site on this. If you want to go
19 to slide 67.

20 JUDGE JUNG: Okay.

21 MR. GOLDBERG: They actually admitted in their Patent Owner
22 Response that the claim language in the '609 patent is intended to convey
23 the purpose of the hollow center to reduce the thermal stress in the substrate.
24 And because all it is the purpose, that is not a proper limitation in an
25 apparatus type claim, which is what we're dealing with.

1 JUDGE JUNG: Okay. But you would agree that limitation could still
2 be read to provide some structural limitation on that hollow center, correct?
3 I can imagine, and this is unsupported hypothesis, but I can imagine a void
4 being so small that there's no space for the conductive filler to actually
5 expand inward into. So there seems to be -- there might be something just
6 beyond the mere existence of a void that would help reduce thermal stress.
7 Just accepting my assertion that there's something more than just the mere
8 existence of a void, would you agree that the language, if that was true, it
9 would provide some kind of structural limitation?

10 MR. GOLDBERG: Yes, Your Honor, we would agree that if there
11 was a void, as you're suggesting, that did not allow for a reduction in stress,
12 then that would potentially be a structural limitation.

13 JUDGE JUNG: Okay.

14 MR. GOLDBERG: The issue here, though, is that we don't have in
15 the record any evidence of the possibility of such a void like you're talking
16 about existing. Patent Owner attempted to come forth with a couple
17 different documents, things that they've pointed to, where they think, oh,
18 there's a void and it actually increases the stress, or it doesn't impact the
19 stress.

20 But in every single instance, if we analyze the document, we look at
21 the document, all of the evidence in this case shows that if you have a void,
22 it will reduce the stress and that will then meet the claim language, even if
23 that requirement was to exist.

24 JUDGE JUNG: And to confirm my understanding of your position, if
25 we give patentable weight to that phrase, to reduce thermal stress in the

1 semiconductor substrate, does that mean your 102 challenge fails and we
2 have to turn to your 103 challenge?

3 MR. GOLDBERG: No, Your Honor, because in our 102 challenge,
4 although the Cooney reference does not expressly talk about this reduction
5 in thermal stress, one of ordinary skill in the art would understand that
6 because that void is there, in looking at the reference, that that void would
7 ultimately reduce stress and therefore meet the claim limitation. And then
8 we have as an additional fallback position that it could also be obvious,
9 because there is this point, as we started off today's discussion with, that the
10 void is optional in Cooney.

11 So the fact that it's optional, the fact that it can be there, that is
12 sufficient. But if for some reason we needed to justify saying we're actually
13 going to use the void, and we don't think we do, but if that justification was
14 needed, then one reason to have the void, as demonstrated not just by the
15 testimony of Dr. Thompson, but backed by other references, is that you
16 would actually put this void in to reduce the thermal stress that's happening.

17 JUDGE JUNG: Okay. Along the same line, does that also mean that
18 we need to find that, based on the record evidence, that all voids reduce
19 thermal stress in the substrate to reach -- to decide in your favor for the
20 anticipation challenge?

21 MR. GOLDBERG: The reason I hesitate, Your Honor, is that I think
22 that there could be a way to find anticipation, not based necessarily on
23 inherency, which is what the all voids would get us to, but also a potentially
24 slightly lower threshold of that one of ordinary skill in the art reading
25 Cooney, this is what they would understand it to be. Maybe short of
26 inherency, but still, this is just the way one of ordinary skill in the art would

1 understand it, because Cooney does not go the opposite way and talk about
2 this theoretical possibility that Your Honor put up of somehow having a void
3 that doesn't reduce stress.

4 JUDGE JUNG: Okay. And then, all right, that kind of leads to the
5 next series of questions, because there's a little bit of a blurring between the
6 102 and 103 challenge because you're using knowledge in the art to kind of
7 help your case. So where exactly does your obviousness argument start? Is
8 it at the top of page 21? Is that where 103, your obviousness arguments
9 begin? I'm sorry, it's just page 21 of your Petition.

10 MR. GOLDBERG: Yeah, let me just take a quick look here. Yes,
11 Your Honor.

12 JUDGE JUNG: Okay. So the only difference between your 102 and
13 103 challenges kind of seems to me it just boils down to how we treat
14 knowledge in the art. Is that right?

15 MR. GOLDBERG: Yes.

16 JUDGE JUNG: So for your 102, we'd have to determine that that
17 void in Cooney would have been understood to disclose that hollow center
18 that reduces thermal stress in the substrate. But for the 103, it's -- just
19 verifying my understanding, you would want us to determine that the void
20 suggests, teaches or suggests void that reduces thermal stress in the
21 substrate?

22 MR. GOLDBERG: Yes, in the sense that in the obviousness position,
23 to the extent that there was any ambiguity about whether the void by itself
24 would necessarily reduce the stress, and maybe there was a question about
25 are we going to do the option where we have the void or are we not going to
26 do the option where we have the void? One of ordinary skill in the art

1 would want to do the option where you have the void because the void
2 would have these benefits of reducing stress that are articulated in those
3 other options.

4 JUDGE JUNG: Okay. I think I slightly misunderstood your position.
5 For your 103, that option of void is no longer optimal. You're just putting it
6 in there. Is that a better way to characterize your 103 argument?

7 MR. GOLDBERG: I think that that would be a fair way to
8 characterize it. To be maybe more specific, it's really -- as the Petition says
9 at the top of page 21, it's getting at the even if HID argues otherwise. So
10 even if they take the position that somehow this void that's here is not
11 sufficient, it would still be obvious to do it that way. It would still be
12 obvious to have a void like that. Now, given that there's no requirement in
13 the law to deal with all the bodily incorporation type of stuff, I don't know
14 that it's necessarily required to deal with this, is the void optional or not?
15 That's just the way that I was articulating it to try to make it clear.

16 JUDGE JUNG: Okay. And is it correct to say that you're not
17 proposing any modification to the void itself?

18 MR. GOLDBERG: No, Your Honor.

19 JUDGE JUNG: If you read paragraphs 127 and 130 of Dr.
20 Thompson's declaration, he starts off with because there's structural
21 similarities between the void in Cooney, and then the void in Pogge and
22 Edelstein, that one of ordinary skill in the art would have realized or
23 understood or would have taught or suggested that the void in Cooney also
24 reduces thermal stress in the same way as Edelstein or Pogge. Is that
25 correct?

1 MR. GOLDBERG: Yes, Your Honor. We're not suggesting
2 structural modifications to the void in Cooney.

3 JUDGE JUNG: Okay. So this is kind of unique. It's a 103 challenge
4 with no modification. It's just a different treatment of how we view
5 knowledge in the art?

6 MR. GOLDBERG: Well, the potential, if you want to think about it
7 as a modification, would be, as we discussed before, the 102 position where
8 if somehow the Cooney structure alone, just what's there is not sufficient
9 because, for example, if the Board was to find that patentable weight does
10 need to be given to that purpose, then this is another way to get to that extra
11 information.

12 JUDGE JUNG: Okay. And in view of the amount of time left, you
13 can continue on with your prepared remarks, but I'd like you to just skip
14 ahead to what's known in the art.

15 MR. GOLDBERG: Yes, Your Honor. So if we go to slide 4. So just
16 as a baseline here, and I'll get into the more detailed stuff that I'm sure
17 you're interested in, Your Honor. But there's no question that voids in vias
18 were known, and we can see that in the Pogge reference, in the Edelstein
19 reference, in the Birner reference, which were three of the background
20 references that we used to establish the state of the art, and voids were also
21 known in the Cooney reference itself, which, of course, is the anticipatory
22 and primary reference.

23 It was also known, if we go to slide 5, that from Pogge, so this is not
24 the patent, this is Pogge recognizing that void 25 has an important function
25 in relieving stresses caused by differences in the thermal coefficient of

1 expansion, TCE, of the various materials in and around the feature. So it
2 was known to use voids to reduce stress.

3 And if we go to slide 6, we can see here as well that the introduction
4 of a void or voids reduces the effective modulus and Poisson ratio of the
5 through via, resulting in a compliant through via that exerts much less stress
6 and force on the surrounding structures. So it was well known in the art
7 before the invention to use voids to reduce stress on the surrounding
8 structures, on the substrate in the claims.

9 If we go to slide 7, we can see the Birner reference as well, again,
10 hitting at this issue, the solution here, that the present invention, this is in
11 Birner, overcomes these problems by reducing stress around the through
12 substrate via by filling the through substrate via with an effective material
13 with minimal thermal expansion in various embodiments. The effective
14 material comprises a combination of metal and voids. So we're using voids
15 again to reduce the stress.

16 If we go to -- I'm just looking because I want to go to your point,
17 Your Honor, instead of talking about some other general stuff that I think
18 you're beyond. If we go to slide 38, this is more discussion from Birner here
19 that, again, is within the knowledge of ordinary skill in the art, that a
20 significant difference in a coefficient of thermal expansion between the
21 substrate and the filled material in a through substrate via can create large
22 stress concentration around the through substrate via.

23 And metals typically expand faster than silicon, thus creating regions
24 of high compressive stress in the substrate as well as inside the filled
25 material. So that's the problem, the metal, it wants to expand faster. But if
26 you start to put voids into it, that counteracts the metal wanting to expand

1 faster. It gives it, as we were talking about before in the patent, room for the
2 expansion to occur inwardly instead of going outwardly and breaking the
3 wafers.

4 So again, going back to, I think this might be the same point that I was
5 making on the previous slide on the right side, the present invention
6 overcomes these problems by reducing stress around the through substrate
7 via, by filling the through substrate via with an effective material with
8 minimal thermal expansion.

9 In various embodiments, the effective material comprises a
10 combination of metal and voids, and hence a combination of metal with
11 voids produces an effective material with a coefficient of expansion
12 comparable to the substrate. In one embodiment, this effective material
13 comprises a void tailored to specific dimensions and shape.

14 So that point, that last sentence there, that is just giving an example of
15 one way to do it. It's not saying that you have to be using particular sizes
16 and shapes.

17 If we go to slide 39, toward the bottom of Birner here, this is one of
18 the sentences that Patent Owner points to and tries to argue that Birner
19 actually says there's voids that don't reduce the thermal -- the expansion
20 issues.

21 And what they point to at the very last sentence here. It says that, in
22 other words, a partial fill that covers about 15 percent of the sidewall of the
23 trench minimizes the stress from thermal expansion. And they latch on to
24 this particular sentence to say that, well, this whole sentence here, it's
25 talking about all these specific formulas and specific dimensions and you

1 have to be using these. And through sleight of hand, it's to reduce the
2 thermal expansion problems.

3 But here, it's not to reduce. The sentence is talking about to
4 minimize, which is very different. So, Birner gives general disclosure of
5 voids reduce stress. And then it gets into this more specific, if you want to
6 minimize it, then here's the particular ways that you can do that. But this is
7 not teaching that other voids are going to increase stress or other voids aren't
8 going to do anything. It's just giving a particular way of, if you want to
9 absolutely minimize it, this is one way that you could absolutely minimize it
10 as opposed to having a void that just reduces the thermal stress.

11 We know the difference, if we go to slide 40. Just looking at different
12 dictionaries, comparing them to the claim. The claim, again, it says reduce
13 thermal stress. We know that reduce means just to do something like
14 diminish in size. This is as compared to minimize, which is what Patent
15 Owner's counsel is pointing to --

16 JUDGE JUNG: I'm sorry to interrupt, Mr. Goldberg --

17 MR. GOLDBERG: Yes.

18 JUDGE JUNG: -- but Judge Peslak has lost connection, so we've got
19 to pause here for a moment.

20 MR. GOLDBERG: Okay. Thank you for noting it.

21 JUDGE JUNG: Judge Peslak, can you see and hear us?

22 JUDGE PESLAK: Yeah, I can hear, I can see.

23 JUDGE JUNG: Okay. All right. Mr. Goldberg, are you ready to
24 proceed again?

25 JUDGE PESLAK: We're on slide 17?

26 JUDGE JUNG: We're on slide 40.

1 MR. GOLDBERG: How far back should I go? Did we figure it out
2 right after he dropped, or is this like a 10-minute thing we lost?

3 JUDGE JUNG: I think about a minute or two.

4 JUDGE PESLAK: -- You were on slide 40?

5 MR. GOLDBERG: Yeah, I was on slide 40. I guess you'll be able to
6 look at the transcript.

7 JUDGE PESLAK: Yeah, okay.

8 MR. GOLDBERG: Okay. So, on slide 40, again. The point that I'm
9 making here is we had just gone through on slide 39, paragraph 38 of Birner,
10 where it's using the word minimize. And I was noting on slide 40 that the
11 claim itself doesn't require minimizing thermal stress, it just requires
12 reducing it. And those words have very different meanings as shown by the
13 dictionary definitions on the slide.

14 If we go to the next slide, slide 41, we can see here a testimony from
15 our expert essentially rebutting what Patent Owner had argued about these
16 discussions in Birner being something that somehow showed that they
17 increase stress or that they don't affect stress at all.

18 And he explains that a person of ordinary skill in the art would
19 understand from Birner that selecting a void size based on the ratio that's in
20 that paragraph may diminish the stress in the substrate to a lowest possible
21 value. Nothing in Birner, however, discloses or suggests that void sizes not
22 based on the ratio do not reduce the thermal stress, even though such
23 reduction may not be the lowest possible value.

24 So again, he's just explaining this difference between minimize,
25 which is what the reference says, versus what the claim says, which is just
26 reduce. So the fact that it's talking about minimizing, that's one option to

1 get even a better result, but that doesn't say if you don't do all the special
2 stuff you're going to get no result. It just says here's how you get the best
3 possible result.

4 So a person of ordinary skill in the art would not have understood
5 Birner as disclosing that only some voids reduce thermal stress, which is
6 what Patent Owner's argument does. And him summarizing the metal-void
7 combination, regardless of void size, reduces thermal stress in the substrate,
8 though not necessarily to the lowest possible value.

9 Again, this is talking about what's in Birner, and a person of ordinary
10 skill in the art would not have interpreted Birner as disclosing or suggesting
11 that a void must be designed in a particular manner to reduce thermal stress
12 in a substrate. It's only to get to that minimum that you need to maybe do
13 some of that special stuff.

14 If we go to slide 42, Kinoshita reference, this is one that was
15 introduced by Patent Owner. As an initial matter, we'll note that this is
16 subject to the motion to exclude that's been filed, both because it has not
17 been properly authenticated, and secondly that it's actually two years or
18 more after the date of the patent. So in our view, it's really not an
19 appropriate thing to even be looking at. But even if the Board wants to look
20 at it, rather than support Patent Owner's point, it actually supports our point
21 that all voids are going to be reducing thermal stress.

22 If we go to slide 43, we can see here Figure 7. This is a figure that
23 both parties have pointed to. The parties have taken a little bit of a different
24 view on how to interpret the figure. Our view is, this is directly from the
25 reference on the left, it says without void, on the right it says with void. And

1 dark blue is a lot less stress than light blue, and by dark blue I'm talking
2 about the darkest blue on the very left, that's 0-50 MPa.

3 And we can see that there's a lot more dark blue on the substrate in
4 the situation where you have a void than in the situation where you don't
5 have a void. So by putting in this void, you are significantly reducing the
6 stress on the substrate, because you have all this extra dark blue.

7 And I'll note that the claim, it doesn't specify where on the substrate
8 you have to reduce stress. You just have to reduce stress somewhere. And
9 because there's a whole lot more dark blue than light blue on the right side,
10 with the void, we know that by having the void, you have reduced thermal
11 stress.

12 If we go to slide 46, we have on the left side here the way that Patent
13 Owner is interpreting this, and they're trying to say that while there's this
14 little bit of a difference between the blue that's on the interior surface of the
15 substrate without a void, versus on the with a void part, and they try to draw
16 a distinction between in the bottom there where it's articulating what the
17 different colors mean, they try to say, well, on the left side, it's really close
18 to the dark blue, and on the right side, it's all the way at the edge of the light
19 blue. So it's actually the opposite that, in their view, without a void is
20 somehow increasing the stress.

21 We would submit that this difference that they're pointing to is really
22 just an artifact of the image itself, of the way that there's more of these little
23 black lines that are some kind of grid structure that's shown there. The
24 graphic as articulated by the Kinoshita reference itself is not intended to
25 provide that level of specificity that they're trying to draw from it. And we
26 know this because if we looked at the text of Kinoshita, on the right side of

1 the slide, it says, and this is highlighted, in the cases of the TSV structure
2 without voids and with a void, the stress on the inner surface of silicon was
3 estimated to be about 100 MPa. So the text of the document is telling us it's
4 actually the same on both of those inner surfaces.

5 But even if they were right, and that inner surface somehow has
6 higher stress, it doesn't matter, because on the right side, with the void, you
7 still see that huge amount of additional dark blue, which means that stress is
8 being reduced in the substrate, and that is all that's required. So every
9 example here that we're seeing, voids reduce stress. There's not been a
10 single counterexample from Patent Owner that stands up to scrutiny of a
11 void that does not reduce stress.

12 If we go to slide 50. So I think, Your Honor, that I've covered the
13 void, the background art on that. Were there any other questions, though,
14 before I move on further?

15 JUDGE JUNG: I have nothing else. You can cover whatever you
16 want. I'm satisfied with your presentation.

17 MR. GOLDBERG: Thank you. Let me just get back to, you had a
18 question about the figures in Cooney and whether Dr. Thompson had any
19 testimony linking them together and how they go. If we look at paragraph
20 86 of the original Thompson declaration, he articulates there that the
21 reference is talking about how Figures 1 to 10 show a series of diagrams.
22 And then he explains that although they've used some different, slightly
23 different numbering in some of them to show the progression, that it's all the
24 same thing. So that would be, from our perspective, the point where he's
25 articulating that it's okay to be looking at these different figures and
26 recognizing that the void would still be there, although it's not shown.

1 JUDGE JUNG: Okay. That still doesn't have Dr. Thompson come
2 out and say the void is still there in Figure 10, right? It just says the
3 substrate from Figure 1 is the same as the substrate in Figure 10, and the
4 element labeled 24 from Figure 1 is also the same as the element labeled 24
5 double prime in Figure 10. It really says -- you see the problem I'm having
6 with the testimony here? I can make a reasonable extrapolation, but Dr.
7 Thompson didn't seem to make that same extrapolation.

8 MR. GOLDBERG: He doesn't use the exact words, Your Honor, that
9 you're asking for. We do think that the testimony that he's providing,
10 combined with the reference itself, should be sufficient for the Board to
11 appreciate and find that that void would be there as you go through the
12 process, regardless of whether that express statement and those exact words
13 is used in Dr. Thompson's declaration.

14 JUDGE JUNG: And correct me if I'm wrong, but there is no
15 pushback from Patent Owner about the existence of the void in Figure 10,
16 correct? There was no dispute that it could be there.

17 MR. GOLDBERG: I don't recall there being any, Your Honor, but --

18 JUDGE JUNG: I don't either.

19 MR. GOLDBERG: -- he may be able to point you to something.

20 JUDGE JUNG: Okay.

21 MR. GOLDBERG: Just one other point that I wanted to make is that
22 at one stage of the briefing, it seemed that Patent Owner might be taking a
23 position that the Pogge reference and Edelstein reference did not disclose
24 reducing stress. But I think that in their slides today, I want to say might be
25 slide 18, but it's somewhere in their slides, they actually now admit that
26 those are reducing stress. So I think that argument has fallen off the table,

1 which was, I believe, the main argument against the obviousness positions
2 for Cooney.

3 JUDGE JUNG: Okay. Thank you.

4 MR. GOLDBERG: Yeah. And with that, I will stop unless either of
5 the remote judges has any questions.

6 JUDGE JUNG: Judge Peslak is disconnected again, so I'll pause your
7 timer here. And then you'll have, I'm sorry, 23 minutes for rebuttal.

8 MR. GOLDBERG: Okay.

9 JUDGE JUNG: And then, Mr. Mercadante, you have to give us
10 another minute or two to get Judge Peslak connected.

11 MR. MERCADANTE: No problem, Your Honor. I'll get my
12 computer set. Are we ready to go?

13 JUDGE JUNG: Looks like Judge Peslak is back. Judge Peslak, can
14 you hear us and see us?

15 JUDGE PESLAK: Yes, I'm back. Can you hear me?

16 JUDGE JUNG: Yes, I can hear you. All right. Mr. Mercadante, how
17 much time would you like to reserve for rebuttal?

18 MR. MERCADANTE: Fifteen minutes, please.

19 JUDGE JUNG: You may proceed when ready.

20 MR. MERCADANTE: Thank you, Your Honor. I appear to be
21 having the same issue with the HDMI cable. Your Honor, while we just
22 wait for the computer to connect, I think Your Honor has correctly identified
23 the fundamental assumption that basically all of the issues in this matter
24 relate to. The claim construction argument, the anticipation argument, and
25 the obviousness argument are all based upon the assumption by Dr.
26 Thompson and Petitioner that all voids decrease thermal stress.

1 Without that, all of their arguments fall apart. And that's a bold
2 statement. That's an absolute. All voids, in every situation, of every size
3 and shape, in every kind of TSV, made of every kind of material in history,
4 decrease thermal stress in the substrate.

5 JUDGE JUNG: Mr. Mercadante, just to make sure that you're
6 replying directly to Mr. Goldberg, Mr. Goldberg just told me that his
7 position doesn't rely on all voids reducing thermal stress to prevail in the
8 102 or the 103. So with that in mind, can you reframe your argument?

9 MR. MERCADANTE: Well, I don't think that's correct, because if
10 we look at Dr. Thompson's argument, for the anticipation ground where this
11 is covered in paragraph 123, which was discussed earlier, he says, because
12 Cooney discloses the presence of the hollow center, it is my opinion that
13 Cooney's void 25 reduces thermal stress into Cooney's substrate. Because it
14 exists, it reduces stress. The obviousness argument is based upon a similar
15 assumption, which says that, well, even if it doesn't reduce thermal stress,
16 the person of ordinary skill in the art would have known that every void
17 reduces thermal stress.

18 That's just combining the disclosure in Cooney, which is bare, which
19 doesn't say anything about what the optional void does or doesn't do, with
20 the knowledge of a person of ordinary skill in the art, which, according to
21 Petitioner, is that all voids reduce thermal stress. If they don't have this
22 fundamental assumption about all voids reducing thermal stress, then none
23 of their arguments have any analysis. They don't analyze the void in
24 Cooney to say why or how it reduces thermal stress. The knowledge of skill
25 in the art is just based on a collection of secondary references that happen to
26 have voids that they contend reduce thermal stress. And --

1 JUDGE JUNG: Okay. Mr. Mercadante.

2 MR. MERCADANTE: Yes.

3 JUDGE JUNG: Before you go on, are you still looking at paragraph
4 123 of the Thompson declaration?

5 MR. MERCADANTE: I am, Your Honor.

6 JUDGE JUNG: Okay. So it seems like the narrowest reading of this
7 paragraph is that it's just Cooney's void 25 that reduces thermal stress in
8 Cooney's substrate. It's not that all voids everywhere reduce stress in the
9 substrate. It seems to me, correct me if I'm wrong, but it seems to me that
10 this testimony is limited to what we're looking at in Cooney, that void 25,
11 and in Dr. Thompson's opinion, it reduces stress in the substrate.

12 MR. MERCADANTE: It's unclear to me what Dr. Thompson is
13 relying on, but I did ask Dr. Thompson in his deposition what he meant.
14 And he told me it was because all voids reduce thermal stress. And I have a
15 slide on this. It's slide 19. I apologize, the subheading about Pogge and
16 Edelstein is incorrect. But he said, Cooney doesn't use the word stress. This
17 is slide 19, which cites to pages 30 and 31 of his deposition transcript.
18 Cooney doesn't use the word stress, but things that are obvious don't need to
19 be said. A void that's buried obviously reduces stress as the tungsten
20 expands and squashes, squashes the void and expands inward into the void.
21 That's what he told me, Cooney's void reduces thermal stress.

22 But he has no analysis whatsoever about why or how the void reduces
23 the thermal stress. And I want to back up a little bit because we can take this
24 one issue that infects claim construction and anticipation, perhaps, and
25 obviousness, and really treat it holistically. I'd like to start with the claims,
26 move to the spec, and then we can talk about some of the extrinsic evidence.

1 JUDGE JUNG: Since you're going to change topics here, let me just
2 ask you a couple of questions.

3 MR. MERCADANTE: Of course.

4 JUDGE JUNG: There was a minor dispute about the parties'
5 proposed level of ordinary skill, and Petitioner, in his reply, said it's not a
6 material dispute. Do you agree that any differences in the parties' proposed
7 level of ordinary skill wouldn't affect your analysis or the Petitioner's
8 argument?

9 MR. MERCADANTE: We agree, Your Honor.

10 JUDGE JUNG: Okay. And just to verify my understanding, you're
11 not -- are you disputing, or actually, are you or are you not disputing that
12 void 25 makes it all the way to Figure 10 of Cooney?

13 MR. MERCADANTE: We have no discussion about whether void 25
14 makes it all the way to Figure 10 of Cooney. So I would say we have no
15 position regarding that, not no dispute, no position.

16 JUDGE JUNG: Okay. And would you at least agree that some voids,
17 because there seems to be a lot of evidence in the record, some voids do
18 reduce thermal stress?

19 MR. MERCADANTE: Absolutely, Your Honor. Some voids reduce
20 thermal stress.

21 JUDGE JUNG: And that same evidence also seems to indicate that
22 it's within ordinary skill to provide a void in a substrate to reduce thermal
23 stress. For example, these ratios, calculations, particular sizes, it all seems to
24 be a matter of ordinary skill.

1 MR. MERCADANTE: You know, Your Honor, I don't think there's
2 evidence in the record that the person of ordinary skill in the art could design
3 the particular void in Cooney to reduce thermal stress.

4 JUDGE JUNG: Okay. All right. But in general, it's within ordinary
5 skill to design a void?

6 MR. MERCADANTE: In general, we do not dispute that there were
7 voids in the prior art in TSVs that did reduce thermal stress --

8 JUDGE JUNG: And it's within ordinary skill to provide one.

9 MR. MERCADANTE: I don't know that we have a position on that,
10 Your Honor.

11 JUDGE JUNG: Okay. But it does seem clear from all these other
12 references or exhibits put into the record that it is a matter of ordinary skill.
13 For example, Pogge, Edelstein, and the two that you put in, Kinoshita and --

14 MR. MERCADANTE: But there's no particular argument advanced
15 by Petitioner that Cooney would be modified to provide, there's no
16 modification at all. So the issue of whether creating a void that reduces
17 thermal stress could be done in the prior art that's of record, the actual
18 anticipation and obviousness prior art, not secondary references, is not at
19 issue in this proceeding. So we have no position on arguments that
20 Petitioner has not advanced.

21 JUDGE JUNG: Okay. All right, please continue.

22 MR. MERCADANTE: Okay. So I'd like to start with the claims
23 themselves, which is often where I like to start with respect to these issues.
24 The claims say that each of the vias has a hollow center to reduce thermal
25 stress in Claim 1. It's worded a little differently in Claim 11. But at the end
26 of the highlighted section, I'm on slide 5, it says, for reducing thermal stress

1 in said semiconductor substrate. That already is very good evidence that not
2 all hollow centers reduce thermal stress. Because otherwise the claim could
3 just say a hollow center and you're done, because apparently all hollow
4 centers reduce thermal stress.

5 So if the claim just said a hollow center, we wouldn't be here. But the
6 claim says a hollow center to reduce or for reducing thermal stress. That
7 already is the best evidence we have of the inventor's intent to claim a void
8 or a hollow center that works to reduce thermal stress.

9 Then we talk about the patent itself. Your Honor had a colloquy with
10 opposing counsel about this. The Specification specifically states that the
11 hollow portion reduces thermal and mechanical stress in the substrate by
12 providing space for the conductive filler to expand inward rather than
13 outward in high temperature conditions. Again, that's an expression from
14 the inventors that this hollow center needs to do something. It needs to be
15 designed or act in a way such that it reduces thermal stress. That's what the
16 intrinsic evidence tells us.

17 JUDGE JUNG: Okay.

18 MR. MERCADANTE: It doesn't say -- sorry, Your Honor. You can
19 ask your question.

20 JUDGE JUNG: I'm sorry to interrupt, but I was going to say the '609
21 Specification doesn't go much further than that sentence we were discussing
22 with Mr. Goldberg, right? So it seems to indicate that, yes, you can put a
23 void in the TSV to reduce thermal stress, but there's no further discussion
24 about the particular size or what its shape should be, or, I don't know,
25 whatever other pertinent factors need to be taken into consideration.

1 So doesn't all that indicate or should indicate that it's a matter of
2 ordinary skill to decide what the size should be, where it should be, and
3 whatever else a void needs to reduce thermal stress?

4 MR. MERCADANTE: Well, Your Honor, there is discussion,
5 although not in text, in the figures, about the size and shape of what the
6 patent refers to as a hollow center. It does appear to look different from
7 some of the voids that we see, particularly in Cooney, but I agree with you
8 that in text, there is no particular discussion of how to design the void other
9 than what we see here in columns 4 and 5.

10 JUDGE JUNG: Okay. So if I wanted to go your way, you're telling
11 me I'm just left with the figures. The figures provide or tell one of ordinary
12 skill in the art how to make that particular hollow center that reduces thermal
13 stress.

14 MR. MERCADANTE: Well, it sounds like we're maybe talking
15 about enablement or written description, but yes. The person of ordinary
16 skill in the art who understands that not all voids reduce thermal stress in the
17 substrate could read the Specification and look at the figures and could
18 design a void or a hollow center that would reduce thermal stress in the
19 particular application.

20 JUDGE JUNG: Did your expert also provide that same supporting
21 point?

22 MR. MERCADANTE: Our expert did not opine on what the
23 disclosure in the Specification enables or does not enable. Our expert
24 focused on disproving the fundamental assumption of Dr. Thompson that all
25 voids decrease thermal stress, which is not true.

1 JUDGE JUNG: So do you have any other support in the record to
2 point me to that would indicate that the figures would indicate to one of
3 ordinary skill in the art that the hollow center has to have a specific shape
4 and size?

5 MR. MERCADANTE: No, Your Honor.

6 JUDGE JUNG: Okay.

7 MR. MERCADANTE: And so we've got, back to my previous
8 argument, the claims themselves by the virtue of them claiming the void
9 hollow center -- excuse me, that reduces thermal stress in combination with
10 the Specification's discussion, to us is a strong implication that not all
11 hollow centers or voids decrease thermal stress. The claim construction
12 argument, I think, is simple, but more legal than technical. Obviously, we
13 do have this technical issue about whether all voids reduce thermal stress.

14 But I think the main issue is whether the statement in the claim of
15 what we're calling a functional limitation, although that's not really the
16 proper wording because it's not functioning. Our position is that it is an
17 additional structural limitation that the void or the hollow center must be
18 shaped or sized in a way that reduces thermal stress. But the dispute here as
19 to what I'll colloquially refer to as the functional limitations is just really
20 whether those are statements of intended use or not.

21 And if all voids don't reduce thermal stress, then it's not a statement
22 of intended use. It's a structural limitation on the size and shape and
23 construction and manufacture of the hollow center.

24 And so, there was some confusion in the record on the disclosure of
25 this *K-2* case. It seems that both parties were reading it very differently.
26 And I'm on slide 8 for the remote judges, which is just a block quote from

1 the *K-2* case. Now, it is absolutely proper to give functional language
2 patentable weight in a system claim or an apparatus claim. The Federal
3 Circuit is very clear on that in *Wright Medical*. And we think the Federal
4 Circuit is very clear on that in *K-2* itself.

5 In *K-2* itself, and I read the case again this morning trying to
6 understand why there was such a fundamental dispute between the parties
7 about what this case says. I think I figured it out. And in *K-2*, it was an ice
8 skate that was being claimed. And the booty portion needed to be
9 permanently affixed to the skate portion to prevent movement in a horizontal
10 direction.

11 And the Plaintiff had tried to use that functional limitation to prevent
12 movement to completely erase the structural part that said they needed to be
13 permanently affixed. Because in the accused product, it wasn't permanently
14 affixed. It was screwed in. You could undo the screw. So the Federal
15 Circuit did not agree with the Plaintiff that even though the functional
16 limitation was met, the structural limitation could be wiped away. And
17 that's what I think Plaintiff -- I'm sorry, Petitioner is pointing out.

18 What we're saying, what we're citing this case for, is simply the
19 Federal Circuit saying that even if they're permanently affixed, you still
20 need to meet the functional part of the claim, which is to prevent movement
21 in this particular horizontal direction. You can't just ignore claim
22 limitations simply because they're functional and you say, well, it's a system
23 claim. We don't need to look at this limitation. The majority of the case
24 law that Petitioner relies upon is simply statements of intended use in
25 preambles, which we see all the time, right? And absent some extenuating
26 circumstances, it's atypical to give weight to those kinds of statements.

1 But what we have here in the '609 patent, and I'm on slide 7, is not a
2 statement of intended use. It doesn't say a hollow center that everyone
3 knows uses, it reduces thermal stress. This is a hollow center to reduce
4 thermal stress. Or in the case of claim 11, a hollow center for reducing
5 thermal stress. It's a limitation on how the hollow center is made.

6 We have two pieces of prior art -- I'm sorry, two references that seem
7 to us to indicate that the assumption by Dr. Thompson that all voids decrease
8 thermal stress is not correct. We have the discussion in Birner, which is
9 actually relied upon by them, where he talks about a tailored void 90 that is
10 made in a specific way. We talked about paragraph 38 and all of this math
11 that he goes through to, quote-unquote, minimize the thermal stress.

12 And, sorry, I have one more citation to Birner, which is in our papers.
13 It is paragraph 73, where he additionally talks about a tailored void that
14 comprises dimensions that are tailored to minimize stress concentration
15 during, for example, subsequent thermal cycling. The void must be tailored
16 to minimize thermal stress.

17 Now, the dispute here seems to be, I think, made too much about the
18 grammar, right? The claim says reduce while Birner says minimizing.
19 We're not saying that Birner discloses a void that increases thermal stress or
20 a void that has no impact on thermal stress. We are saying that Birner
21 discloses, consistent with what our expert says, that you need to design a
22 void or a hollow center that reduces thermal stress. That the person of
23 ordinary skill in the art would need to do something. He talks about 3D
24 analysis, finite element analysis. He's got math. You do something to come
25 up with a design that, if thermal stress is a concern, you can reduce it.

1 Now, that's far different from what Dr. Thompson does in his analysis
2 of Cooney. He has no analysis at all. He says because there's a void for the
3 anticipation ground, he says because there's a void, it reduces thermal stress.
4 I think probably that's not even enough because that's an inherency
5 argument and they have no inherency argument. Their Petition doesn't say
6 inherent once.

7 And so they're relying on this alleged fundamental principle for an
8 anticipation ground where Cooney doesn't mention thermal stress, doesn't
9 mention why the optional void is there at all. Just says there's an optional
10 void and drew a circle with a dotted line. That's it.

11 And for the obviousness argument, he relies on the knowledge of a
12 person of ordinary skill in the art that all voids reduce thermal stress.
13 Which, if you even just look at Birner, his own cited prior art, it's clear that
14 there must be some analysis that occurs to come up with a void that
15 decreases thermal stress.

16 JUDGE JUNG: Let me just make sure you're directly addressing
17 Petitioner's argument. The argument, as I just clarified with Mr. Goldberg,
18 is that the void of Cooney is structurally the same as the void of Pogge and
19 Edelstein. It's not that all voids decrease thermal stress. It's that the void of
20 Cooney is like these other two voids in Pogge and Edelstein which reduce
21 thermal stress. So if they're the same, if they're structurally the same, if the
22 void in Pogge reduces thermal stress, then the void in Cooney must also
23 reduce thermal stress.

24 MR. MERCADANTE: But that's not their argument. That's
25 completely made up. If we look at the voids in Pogge and Edelstein, they're
26 different. There are different shapes. There's different materials. There's

1 multiple additional layers. They're not saying they're the same. They're
2 saying that because there are voids, there's a reduction in thermal stress in
3 Cooney. This is just -- it doesn't matter if there are a hundred different
4 Pogges and a hundred different Edelsteins or a hundred different references
5 that have voids that decrease thermal stress. Those are particular examples
6 of particular engineering in which there is a reduction in thermal stress in the
7 substrate.

8 And if their argument was it would be obvious to combine Cooney
9 with Pogge or Edelstein or any of these other arguments, or it would have
10 been obvious to modify the void in Cooney to be like these other voids, then
11 maybe we would be having a different discussion. That's not their
12 argument. That's not what's in their Petition.

13 Their Petition is that because Cooney's void exists, full stop, there's a
14 reduction in thermal stress in the substrate. That's it. And their argument
15 with Pogge and Edelstein and these other secondary references is not that
16 there would be a modification. It's just merely to support the knowledge of
17 a person of ordinary skill in the art that all voids reduce thermal stress in the
18 substrate, which is wrong. Birner teaches us that you have to do some
19 design or some analysis to figure out or to come up with a hollow center that
20 reduces thermal stress.

21 And then we get to Kinoshita, where I think there's a pretty clear
22 statement that you've got a void and thermal stress goes up. We talked
23 about Figure 7 earlier. I'd like to focus on Figure 5. This is the simulation.
24 By the way, Birner says you need to run simulations to figure out what
25 happens inside these voids. It's complicated. Well, here we have Kinoshita
26 running just such a simulation.

1 JUDGE JUNG: For the record, you're on slide 15?

2 MR. MERCADANTE: Yes. I'm sorry, Your Honor. I am bad at
3 reading the slide numbers as I bounce around. I am on slide 15. We've got
4 Kinoshita in Figure 5. Now, this is what's going on inside the void -- no,
5 I'm sorry, inside the TSV, not in the substrate. But it's extraordinarily clear
6 through both measurement and through looking at the figures that the void,
7 the presence of the void under these conditions, increases the thermal stress
8 inside the TSV. And our expert says that when you've got increased
9 thermal stress inside the TSV, that stress radiates outward into the substrate.
10 There's nowhere else for it to go.

11 So we've got an example of a void increasing thermal stress in the
12 substrate. That causes their entire argument to fall apart, every part of it.
13 The fundamental assumption that all voids decrease thermal stress is wrong.
14 And even if they're now modifying it to say that, well, the particular void in
15 Cooney decreases thermal stress, their Petition and their expert declaration
16 lack analysis. There's no analysis as to why. It's completely bare. There's
17 no question that in the TSV, here shown in Cooney -- I'm sorry, in
18 Kinoshita, that the presence of a void acts to increase the thermal stress.

19 And they say, well, you can't look at this. Petitioner says you can't
20 look at Figure 5 at all because that's what's going on inside the TSV. And
21 there's no evidence at all. Our expert's assertion that that stress radiates into
22 the substrate lacks support and should not be considered. But that's the
23 same thing that Dr. Thompson does in his analysis of Cooney. And what's
24 more, Cooney has a liner layer in between the TSV and the substrate.

25 So to the extent they say that we can't rely on what's happening inside
26 the void in Kinoshita, then that same logic applies to Dr. Thompson's

1 analysis of the void in Cooney, where there's actually additional stuff in
2 between the TSV and the substrate.

3 And then I just have one more point on Kinoshita, which is the figure
4 that Counsel brought up, the Figure 7, which shows up in their Reply and
5 was addressed in our Sur-reply. And for the record, I'm on slide 31 of our
6 presentation.

7 This is their figure that shows up in their Reply. And they say that,
8 well, because there's more dark blue, this is now -- instead of what's going
9 on in the TSV, Figure 7 is showing what's happening in the substrate. And
10 they're saying that, well, on the right, that's the with void situation. They're
11 saying that because there's more dark blue, there's now less stress in the
12 substrate. But if we look at the colors in the figure, it doesn't take an expert
13 to look at the colors on the right and see that that's a lighter green than the
14 colors on the left.

15 That's an increase in stress on the border of the substrate with the
16 TSV. And that's all we need to show to win all of these arguments, that
17 there exists the potential to be a void that does not decrease thermal stress in
18 the substrate. We've got evidence in Birner that says that there needs to be a
19 specific way to do this, a specific design. And then we've got Kinoshita,
20 where he actually ran the analysis that Birner says you need to run, and
21 shows that in certain instances, at certain temperatures, with certain types of
22 voids, whatever it is, you could have a void that makes your thermal stress
23 situation worse.

24 And I will say, you know, there was a little discussion about the fact
25 that the Kinoshita reference postdates the priority date of the '609 patent and
26 is the subject of a motion to exclude. Kinoshita is used as evidence of these

1 properties, these fundamental properties. Yes, Kinoshita was run, was
2 published, I think 18 months or two years after the priority date, but these
3 are fundamental materials properties. If this same finite element analysis
4 was run two years prior or three years prior, the results would have been the
5 same.

6 We're not relying on Kinoshita for an innovation or some sort of
7 contemporaneous analysis of something. We're using Kinoshita to show
8 that the person of ordinary skill in the art, whether he had this Kinoshita
9 simulation or not at the time of the invention, would have known that you
10 need to specifically design a hollow center to reduce thermal stress. And it
11 is the details of the specific design that is completely missing from Dr.
12 Thompson's anticipation analysis, completely missing from his obviousness
13 analysis, and which also infects their claim construction position. Unless
14 Your Honor has any more questions, I'll reserve the remainder of my time.

15 JUDGE JUNG: One last question. On slide 67 of Petitioner's
16 demonstratives, they quote you from the Patent Owner Response, and the
17 quote is, the claim language in the '609 patent is intended to convey the
18 purpose of the hollow center to reduce thermal stress in the substrate. Do
19 you want to provide a clarification?

20 MR. MERCADANTE: Yes. No, I mean, I think that's proper. I
21 think they're misconstruing that statement to be a statement of intended use.
22 The purpose, meaning the structure of the hollow center, is to reduce thermal
23 stress. The statement in the claim, as I've said a few times now, is that the
24 hollow center must be designed in such a way to reduce thermal stress. That
25 is essentially what the '609 patent is claiming. The purpose of the hollow
26 center as claimed is that it needs to reduce thermal stress in the substrate.

1 And so if you have a hollow center, a void that does not reduce
2 thermal stress, it doesn't meet the claim. And if you have an analysis that
3 says all voids reduce thermal stress, that's how I know the optional void in
4 Cooney reduces thermal stress, that's not enough analysis. That's just
5 simply not good enough in view of what was actually known by the person
6 of ordinary skill in the art, not the self-serving testimony from Dr.
7 Thompson, who just repeats over and over again that all voids reduce
8 thermal stress and hopes that it becomes true.

9 JUDGE JUNG: Okay. So we should read the slide from the Patent
10 Owner Response just to convey that you want the phrase to reduce thermal
11 stress in the substrate to provide a structural limitation on the hollow center?

12 MR. MERCADANTE: That's correct, Your Honor.

13 JUDGE JUNG: That's all you want to convey with that sentence?

14 MR. MERCADANTE: Yes.

15 JUDGE JUNG: Okay. That's all the questions I have.

16 MR. MERCADANTE: Thank you, Your Honor.

17 JUDGE JUNG: Ready?

18 MR. GOLDBERG: Yes.

19 JUDGE JUNG: You may proceed.

20 MR. GOLDBERG: Thank you, Your Honor. I will be brief. I
21 wanted to start by coming back to that line at the bottom of column 4 of the
22 '609 patent that you had brought up at the beginning of the hearing, and it
23 was discussed with the opposing counsel as well, as that line potentially
24 providing some structure that goes along with the function.

25 And just to be clear, I want to make sure I think that line said that the
26 hollow center portion 432 also reduces thermal and mechanical stress in

1 substrate 412 by providing space for conductive filler 432 to expand inward
2 rather than outward in high temperature conditions.

3 So if that is the only structure that's added by this functional stuff at
4 the end of 1B2 limitation, I wanted to note if you look at our Petition, Your
5 Honor, and you look at page 22. At the bottom of page 22 is the next
6 limitation in the claim, 1b-3, which says said hollow center being entirely
7 surrounded by said conductive filler to provide space for said conductive
8 filler to expand inward.

9 Patent Owner has not disputed that Cooney teaches 1b-3, which, if
10 that's the only structure that's imparted by this functional limitation at the
11 end of 1B2, Cooney has it, as shown by 1b-3, which Patent Owner has not
12 disputed. So I don't think there's anything in the '806
13 -- sorry, anything in the '609 patent that can show any possible structure that
14 would be necessary that is not also disclosed by Cooney.

15 Okay. Last point I want to make is HID's counsel showed Figure 5 in
16 their slide 15 and talked about how that stress that is actually in the via itself,
17 according to their expert, it somehow gets imparted to the substrate. And
18 they're saying that's why in Kinoshita we actually know that the via,
19 somehow it increases the stress to the substrate, the hollow center increases
20 the stress to the substrate. The problem with that testimony by their expert is
21 it is directly contradicted by Kinoshita itself.

22 Figure 7 that we've been talking about today is the same conditions as
23 Figure 5, except it's showing the stress in the substrate. And as we
24 discussed earlier, Figure 5 shows that there's that dark blue all over the place
25 showing that it's significantly lower stress. And even if you want to start
26 looking at that inner surface, it doesn't matter because there's the dark blue

1 everywhere else that's showing lower stress, plus the reference itself as we
2 discussed in its text says that it's 100 MPa on the inner surface of both the
3 with a void and without a void.

4 So the reference itself shows that Figure 5 cannot be interpreted the
5 way that Mr. Berg wants it to be interpreted. There is still no reference of
6 record, no evidence of record that shows any instance where a void does not
7 reduce the thermal stress of the substrate. And unless there's any questions,
8 I'll stop there.

9 JUDGE JUNG: I have no questions. Thank you.

10 MR. GOLDBERG: Okay. Thank you.

11 MR. MERCADANTE: Yes, Your Honor. So just briefly to touch on
12 a couple of issues. One, I'm not sure why we continue to be hung up on the
13 Specification's disclosure when the claim itself says that you have to have a
14 void that reduces thermal stress. And that to us begins and ends the analysis
15 unless there's a specific and explicit claim construction saying that you can
16 ignore that claim element. And the only way that you could do that is if it's
17 a statement of intended use. And as discussed earlier, we don't think that
18 statement of intended use analysis applies.

19 Lastly, I just want to respond directly to the discussion by opposing
20 counsel regarding Kinoshita and whether we can look at Figure 5 versus
21 Figure 7. And I'm in Exhibit 2008. We think that the only way that you can
22 square Figure 5 with Figure 7 is to say that their analysis of Figure 7 is
23 wrong because Figure 5 clearly and undoubtedly shows that the existence of
24 the void increases thermal stress. And so, to us, Figure 7, which also shows
25 the voided TSV having more stress than the non-voided TSV, completely
26 comports with the entirety of what Kinoshita is saying.

1 Even if -- we heard something earlier about, well, they changed the
2 grid lines or the colors are really the same and it's too tough to tell with the
3 resolution. But I think counsel said it's said in text, that right here on the
4 bottom of page 107 of Kinoshita, in the cases, the TSV structure without
5 voids and with a void, the stress on the inner surface of SI was estimated to
6 be about 100 mPa, about. So that doesn't mean that there's an increase in
7 stress. It absolutely means that, as shown in the figure, there could be a little
8 bit more stress on the interior of the substrate in the voided scenario versus
9 the non-voided scenario.

10 Second, even if we take that text as true, that they're both about the
11 same or functionally similar for the purposes of Kinoshita's analysis, well,
12 that doesn't show a reduction. Even if they're the same, we win. Their
13 analysis is based on the assumption that all voids decrease thermal stress.
14 And here, even reading Kinoshita in a light most favorable to them, it has no
15 impact. With that, Your Honor, unless there's any further questions, I have
16 nothing.

17 JUDGE JUNG: I have no questions.

18 MR. MERCADANTE: Thank you.

19 JUDGE JUNG: Well, counsel, thank you for your presentation. It
20 was very helpful. Please stay a few minutes after to help the court reporter
21 with any spellings that he might need. Otherwise, we are adjourned. Your
22 case is submitted.

23 (Whereupon, the above-entitled matter went off the record at 4:38
24 p.m.)

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