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

FORCE MOS TECHNOLOGY, CO, LTD., (CAUSE NO. 2:22-CV-460-JRG
)
Plaintiff, (
)
vs. (
)
ASUSTEK COMPUTER, INC., (MARSHALL, TEXAS
) FEBRUARY 10, 2025
Defendant. (8:30 A.M.

VOLUME 2

TRIAL ON THE MERITS

BEFORE THE HONORABLE RODNEY GILSTRAP
UNITED STATES CHIEF DISTRICT JUDGE
and a jury

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EXAMINATION

02:10

Q. (BY MR. HANBA) Dr. Neikirk, can you point to one of the sidewalls of said trenches in said base layer in this figure?

A. So the source contact trenches are these objects. This region is the body region, and so the sidewall of the source contact trench in the body region would be along the side or this side, around that trench.

Q. Dr. Neikirk, what shape are the source contact trenches?

A. As we can see here, these are tapered. They look kind of like a cork, a plug. And so they're tapered as they go down into the body region.

02:10

Q. A plug -- a plug rather than a cork or a cork --

A. Well, we call them plugs, but they've -- look like a tapered cork.

Q. Okay. Thank you.

Dr. Neikirk, have you prepared a demonstrative to assist the jury in understanding your analysis as to the lateral contact layer?

A. I have.

MR. HANBA: So let's bring up PDX 3.9.

02:10

Q. (BY MR. HANBA) So, Dr. Neikirk, can you walk us through your analysis regarding whether the accused products have a lateral contact layer as recited in this limitation?

A. Yes. And in this image, to sort of orient you, there is a trench gate, there's a trench gate. I've been using red for those. This is a source region in orange, and the body region in teal.

This is the trench. And in this picture, that would be -- at this stage, it would be an empty trench. So it's a hole down through these layers.

02:11 Q. And --

A. So to introduce the dopants into this structure, a process called ion implantation is used. Ion implantation takes atoms, makes them go fast enough so that they'll actually end up in this solid material. So up here there's

02:11 nothing there but these atoms coming in. It's kind of like raining down into the trench.

And just like when it's raining, if you stand up, your sides, your sidewalls, they'll get wet, but they won't get soaked; whereas, if you lay down, when you're horizontal, you'll get soaked. So you end up with many more dopants here than you do here.

Q. And so you just mentioned this ion implantation. What is

02:12 your opinion as to whether all of the accused MOSFETs use ion implantation?

A. All of the accused products use ion implantation and, in particular, using boron as the dopant.

MR. HANBA: Mr. Doyle, will you please go to PX 27.2? It's a side view SEM for the Panjit 2K.

02:12 Q. (BY MR. HANBA) Dr. Neikirk, how does this image SEM inform your opinion as to whether the entire sidewalls of the

source contact layers in the base layer of the accused MOSFETs are covered by the lateral contact layer?
A. With this kind of tapered shape and the characteristics of ion implantation, every part of that side wall, the entirety will become doped.
02:13 MR. HANBA: And so, Mr. Doyle, if you'd please zoom out of this.
Q. (BY MR. HANBA) Is this the whole image right here that you -- we got -- excuse me, that you got from Microtech?
A. Yes, it is.
Q. Okay. And so are you aware that ASUS's expert, Dr. Shanfield, has opined that the accused MOSFETs do not infringe this limitation because I believe he says their source contact trenches aren't tapered?
02:13 A. Yes, I'm aware of that.
Q. And do you agree with him, sir?
A. I do not.
Q. Why?
A. Well, if we look at these source contact trenches, they are clearly tapered.
Q. And so, sir, are you aware that Dr. Shanfield also claims that the accused MOSFETs don't infringe this limitation because they receive a single ion implantation into the source contact trenches?
A. Yes, I'm aware of that.

Q. Do you agree with him?
A. No, I do not.
Q. Why not?
02:14 A. Well, I've just illustrated a single ion implantation process where the ions come down like that will implant into the sidewalls and into the bottom. It doesn't require multiple ion implantations to achieve that.
Q. And that was your raining down demonstrative?
A. Yes, that's -- the analogy is rain, and falling into a hole, if you will.
Q. And are you aware that Dr. Shanfield has opined that the
02:14 accused MOSFETs do not infringe because they use rapid thermal annealing?
A. I'm aware of that.
Q. Do you agree with that opinion?
A. No, I do not.
Q. Why not?
A. Rapid thermal annealing is a process that essentially heals defects that can be caused during ion implantation. So if there are any irregularities, RTA, for short, that's what we call it, tends to wash those away. Its whole purpose is
02:15 not to move dopants in any appreciable manner. The dopants are still there in the region of the sidewall and in the bottom.
Q. Sir, but based on your years of experience, how relevant

is rapid thermal annealing to your analysis of this claim limitation?

A. I don't believe it is at all. If anything, it would help even out any small defects or irregularities that might be there.

02:15 Q. And so what is your opinion on whether the Panjit 2K meets the requirements of limitation 1[g]?

A. So I don't think I explained why it's a lateral contact layer.

Q. Excuse me, sir. Well, let's -- thank you.

MR. HANBA: So if we might, let's pull up the

02:16 demonstrative again. Excuse me, the -- actually let's pull up the SEM, Mr. Doyle. I'm sorry, PX 27.2.

Q. (BY MR. HANBA) Does that help inform your opinion as to whether there's a lateral contact layer?

A. Again, this is fine along with the ion implantation explanation. Again, the sidewalls receive dopants, but fewer

02:16 than the bottom. The base region, the body region, establishes the reference for P.

So the sidewalls are implanted and their doping concentration is greater than P. But, again, the bottom receives a great deal more doping. That would establish a reference for P+.

The requirement for a lateral contact layer is that it be

02:17 doped between P and P+, otherwise called by the patent P*.

And the characteristics of the implant process in this geometry will produce such a lateral contact layer.

Q. So is there another picture we can use to show the lateral contact layer?

A. I believe the demonstrative shows that, illustrates that.

Q. This one?

A. Yes. So here where it's flatter, the bottom, it receives many more dopants, it establishes this reference P+. The sides do get ions, the dopants, but not nearly as many. That's larger than P. The body establishes the reference point for P.

Q. And so, sir, now that we've established the lateral contact layer, what is your opinion as to whether the Panjit 2K meets the requirements of limitation 1[g]?

A. It does.

Q. And can I check that box?

A. Yes.

Q. And now, sir, let's go to element 1[h]. Dr. Neikirk, what is your opinion as to whether the Panjit 2K MOSFET satisfies the limitation of 1[h]?

A. It does.

Q. So let's start with the first portion where the limitation states, the bottom base of said trenches in said base layer are covered by the base contact layer. What is your opinion as to whether the Panjit 2K meets this

limitation?
A. It does.
Q. And why?
A. As I illustrated with my demonstrative, my picture, the characteristics of the ion implantation is such that it will dope this bottom region and, again, more heavily than the sides. That will establish a base contact layer.
02:19
Q. And so, sir, what is your opinion on whether the Panjit 2K meets the requirement of limitation 1[h]?
A. It does.
Q. And so can I check that one off?
A. Yes.
Q. And so have we checked off all the limitations for claim 1 of the '634 Patent with regards to the Panjit 2K?
02:19
A. Yes, they're all checked off.
Q. So, sir, what is your opinion on whether the Panjit 2K infringes claim 1 of the '634 Patent?
A. The Panjit 2K practices each and every limitation of claim 1, and hence it does infringe claim 1 of the '634 Patent.
Q. And we discussed previously that if any MOSFET infringes claim 1 of the '634 Patent, does it -- is ASUS liable for infringement -- I'll strike all of that because it was a bad question. Excuse me, Dr. Neikirk.
02:20
If ASUS -- if a single MOSFET infringes claim 1, have we

established that ASUS infringes claim 1?
A. If one of those MOSFETs is in an ASUS product and even if it's only one, it does infringe.
Q. Thank you.
And so have you also analyzed whether other accused MOSFETs infringe claim 1 of the '634 Patent?
A. I have.
Q. And did you analyze whether the LRC MOSFET infringes
02:21 claim 1 of the '634 Patent?
A. I did.
Q. And so did we discuss the LRC MOSFET specification sheet previously?
A. Yes, I believe we have.
Q. And what was your opinion as to whether the LRC is a trenched MOSFET?
A. It is a trenched MOSFET.
Q. Is there -- how about -- what is your opinion as to
02:21 whether the LRC is an N-channel trenched MOSFET?
A. The specification sheet tells me it is a N-channel MOSFET.
Q. So, sir, similar to the analysis for the Panjit 2K MOSFET, for the LRC MOSFET did you review images from Microtech?
A. I did.
MR. HANBA: So, Mr. Doyle, would you please bring up

PDX 3.1?
Q. (BY MR. HANBA) Dr. Neikirk, will you please show your analysis on this demonstrative as to whether the LRC has the features and limitations of 1.pre through 1[f] of the '634 Patent?
A. So just as I explained for the 2K, this product has the same structures in the same relative position with respect to one another. It has to use a lightly-doped drain, an epitaxial layer here, a body region above that, a source region above that. The trench gates, of course, are here.
It has an interlayer oxide. Again, I've used purple again. It has a front surface metal, and the trenches themselves, the dopants are placed in there using ion implantation as we discussed before.
So it has all the same structures for elements 1.pre through 1[f]. The arrangements are the same as what we just discussed. We can see in that that it does satisfy all of those limitations.
MR. HANBA: Mr. Doyle, would you please bring up PX 30.1? It's the SEM of the LRC.
Q. (BY MR. HANBA) And, Dr. Neikirk, would you please explain how this informs your analysis as to whether the LRC MOSFET has the required features for limitations 1[g] and 1[h] of the '634 Patent?
A. So this, again, ion implantation is used to put the

dopants into the empty source trenches. I can see that these are tapered. The same explanation -- the same characteristic of implant that then ends up doping the sides but not as heavily as the bottom.

The bottom establishes the P+ reference. The body region establishes the P reference. This sidewall has a doping that 02:23 is between P and P+, and because of the way ion implantation basically rains down on it, it will implant ions into the entirety of that sidewall. So element 1[g], it's the entire sidewall of the trench and the base layer, and it is covered by a lateral contact layer as the Court has construed those terms.

Q. And how about 1[h]?

A. And for 1[h], we need the bottom. Ion implant will put more in the bottom than it did on the side. That will constitute that base contact layer.

02:24 Q. And so based on your consideration of the evidence, what is your opinion as to whether the LRC MOSFET infringes claim 1 of the '634 Patent?

A. It does.

Q. So did you also analyze whether the Panjit 2KDW infringes claim 1 of the '634 Patent?

A. I did.

Q. And I think we discussed the Panjit 2KDW specification sheet previously. Right?

02:24

A. Yes, we did.

Q. And what did that specification sheet show you?

A. Well, it establishes that it's an N-channel MOSFET, that it's an enhancement mode MOSFET. And I don't remember whether that one said trenched MOSFET on it, but by examining the rest of the information, it is clearly trenched.

Q. And so is there any dispute whether the Panjit 2KDW is a trenched MOSFET?

A. I don't believe there is.

02:25

Q. Okay. And so similar to the analysis of the Panjit 2K MOSFET, for this Panjit 2KDW MOSFET did you review images from Microtech?

A. I did.

Q. What is your opinion as to whether all of the same structures we saw for the Panjit 2K are present in the Panjit 2KDW MOSFET?

A. So all of the same structures are present, their arrangements relative to one another are the same as what

02:25

we've seen in, for instance, the 2K. All of these requirements are met by this product.

MR. HANBA: And, Mr. Doyle, would you please bring up PDX 3.3?

Q. (BY MR. HANBA) I believe, Dr. Neikirk, you said this was a demonstrative you created for the Panjit 2KDW. Is that right?

02:48

Q. (BY MR. HANBA) So are these the -- excuse me.

Dr. Neikirk, are -- is each and every one of the MOSFETs listed on PDX 3.10 infringe claim 1 of the '634 Patent?

A. Yes, they do.

Q. So, Dr. Neikirk, let's move on to claim 2.

What does claim 2 add to claim 1?

A. So claim 2 adds some additional requirements that all relate to the doping type of the various parts of this MOSFET.

02:48

Q. And, sir, what is your opinion as to whether all of the accused MOSFETs infringe claim 2?

A. In -- they all do infringe claim 2.

Q. Why?

A. They are all N-channel enhancement mode MOSFETs. They're all in a silicon substrate. I've already discussed the epitaxial layer. In that kind of N-channel MOSFET, the source

02:49

and the drain must be N type. That's the pre there. The base layer, that is the layer that is below -- the base layer is below the source region and above the N type drain, in an N-channel MOSFET, that must be P type as required in claim 2[a].

The ion implantation that forms the lateral contact layer

02:49

is done using boron, that is a boron dopant. So that is -- I'm sorry, boron is a P type dopant. That's element 2[a].

And for element 2[b], it requires that they have a P-type base contact layer. Again, those are the same boron atoms. So it is P type at the bottom, we've already discussed that.

And for the lateral contact layer, I've already gone over how it has less doping than that base contact layer. The ion implantation process ensures that that's the case.

Q. And that's the rain image?

A. Yes, that's the rain image.

Q. Thank you.

And Mr. -- Dr. Neikirk, what is your opinion as to whether all of the accused components on PDX 3.10 infringe claim 2 of the '634 Patent?

A. All of the products listed on this page do infringe claim 2 of the '634 Patent.

Q. And so moving on to claim 3, which states the trenched MOSFET of claim 2, let's see, wherein further comprises a barrier metal layer and a plurality of contact metal plugs. What does claim 3 add to claim 2?

A. So claim 3 adds a requirement for a specific kind of metal. It's called a barrier metal. It's commonly used in device fabrication. Certain types of metals are viewed as being barrier metal. So they are to stop things going from where they shouldn't.

Q. So have you formed an opinion as to whether the Panjit 2K MOSFET satisfies claim 3?

A. I have.