

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

NEOMAGIC CORPORATION )  
 )  
 Plaintiff, )  
 )  
 v. ) Civil Action No. 98-699-RRM  
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 TRIDENT MICROSYSTEMS, INC., )  
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 Defendant. )

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**MEMORANDUM OPINION**

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Wilmington, Delaware

February 1, 2001

McKELVIE, District Judge

This is a patent case. Plaintiff NeoMagic Corporation is a Delaware corporation with its principal place of business in Santa Clara, California. NeoMagic is the owner of U.S. Patent Nos. 5,650,955 (the '955 patent) and 5,703,806 (the '806 patent), which are directed to a graphics controller used in notebook computers. Defendant Trident Microsystems, Inc. ("Trident") is a Delaware corporation with its principal place of business in Santa Clara, California.

In a complaint filed on December 14, 1998, NeoMagic alleges that certain of Trident's embedded memory graphics accelerators infringe one or more claims of the '955 and '806 patents. Trident has denied it infringes and asserted affirmative defenses of invalidity and unenforceability. The case is scheduled for an eight-day jury trial beginning February 26, 2001.

By a decision dated May 8, 2000, the court described the technology in issue and construed certain of the disputed terms in the claims. That decision is reported as NeoMagic Corp. v. Trident Microsystems, Inc., 98 F. Supp.2d 538 (D. Del. 2000). Since then, each party has renewed motions for a summary judgment on whether Trident infringes the patents.

This is the court's decision on the pending motions.

## I. FACTUAL AND PROCEDURAL BACKGROUND

The court draws the following facts from its May 8, 2000 decision, the pleadings in this case, the affidavits and transcripts of depositions offered by the parties in support

of and in opposition to the pending motions, testimony offered at a January 22, 2001 hearing on the motions, and the stipulations in the pretrial order.

As previously described by the court in its May 8, 2000 opinion, the dispute in this case relates to methods for combining logic and memory on a single semiconductor substrate. The '955 and '806 patents describe a graphics controller with embedded memory that solves the problems of excess noise and latch-up by combining the random logic, the graphics engine, and interfaces with the DRAM in an integrated circuit manufactured in accordance with a standard DRAM process.

NeoMagic alleges that Trident's Cyber 9388, 9520, 9525, 9540 and PV8 embedded memory graphics accelerators infringe claims 1 and 2 of the '955 patent and claims 7, 9, 13, 18, 20, 24, and 26 of the '806 patent. Trident counters that while its accused devices combine logic and memory on a single integrated circuit, it builds the chips using a different process and deals with the problems of noise and latch-up in a different way.

Trident contends NeoMagic's patents claim a method for reducing noise transmission between the memory and logic portions of the chip by forming the transistors of the logic gates in n-wells in a p-type substrate, reverse biasing the substrate with a negative power supply,  $V_{BB}/V_{SS}$ , which is different from the power supply to the logic and memory,  $V_{DD}/V_{SS}$ .

Trident contends that while its graphics accelerators combine logic and memory on one chip, they solve the problems of noise and latch-up a different way. Instead of

isolating the logic gates and reducing noise and latch-up by reverse biasing the substrate regions, Trident's graphics accelerators isolate memory from logic using a triple-well process for the memory, and a single power supply with two voltage supply lines,  $V_{DD}$  and  $V_{SS}$ . Trident connects the substrate to ground,  $V_{SS}$ , rather than to a negative bias power supply,  $V_{BB}$ . Among other things, Trident contends its products do not reverse bias the substrate with a negative voltage.

With certain disputed terms underlined, Claims 1 and 2 of the '955 patent read:

1. An integrated circuit in a semiconductor substrate comprising  
  
a memory portion having a capacity of at least 2 megabits;  
  
and  
  
at least 30K logic gates with underlying substrate regions,  
  
said logic gates interconnected with said memory  
  
portion, said logic gates with a voltage supply having  
  
a coupling to said underlying substrate regions deter-  
  
mined by a voltage of said underlying substrate  
  
regions.
2. The integrated circuit of claim 1 comprising at least  
  
40K logic gates; and said memory portion has a capacity of

at least 7.3 megabits.

Claims 7 and 18 are representative of the claims of the '806 patent asserted by NeoMagic. They read:

7. In an integrated circuit having a logic portion having at least 30K logic gates and a memory portion coupled to said logic portion, said memory portion having a capacity of at least 2 megabits, a capacitor comprising

a first dopant-type transistor in an a second dopant-type well in a first dopant-type semiconductor substrate, said first dopant-type transistor having a gate, first and second source/drains, said first source/drain connected in common to said second source/drain to form a first terminal of said capacitor, said gate forming a second terminal of said capacitor, said a second dopant-type well connected to a first power supply, and said substrate connected to a second power supply at a negative voltage with respect to said first power supply;

whereby said capacitor is isolated from electrical noise in said substrate.

18. An integrated circuit comprising

a logic portion having at least 30K logic gates;

a memory portion coupled to said logic portion, said memory portion having a capacity of at least 2 megabits, and

an analog circuit having a capacitor, said capacitor comprising a first dopant-type transistor in a second dopant-type well in a first dopant-type semiconductor substrate, said first dopant-type transistor having a gate, first and second source/drains, said first source/drain connected in common to said second source/drain to

form a first terminal of said capacitor, said gate forming a second terminal of said capacitor, said second dopant-type well connected to a first power supply, and said substrate connected to a second power supply at a negative voltage with respect to said first power supply;

whereby said capacitor is isolated from electrical noise in said substrate.

In the arguments presented by the parties prior to the court's decision on claim construction, Trident argued it does not infringe any of the claims of the patents in suit as its products have only one power supply and two voltage supply lines, and not two power supplies and three voltage supply lines as claimed by the patents. In addition, Trident argued it does not infringe the claims of the '955 patent as its products have CMOS transistors formed in substrate regions coupled to ground, not to  $V_{BB}$  (i.e., there is not a voltage supply to the substrate different from the reference voltage for the logic gates). Trident also argued its products do not infringe under the doctrine of equivalents, as they do not follow the teaching of the patent to use the DRAM process of reverse biasing the substrate and instead employ a grounded substrate and use a triple-well process for the DRAM, reducing the noise by isolating the memory from the substrate.

In its May 8, 2000 opinion, as clarified by the court during a July 19, 2000 conference with counsel, the court adopted Trident's proposed construction of the terms power supply and coupling, so that the words "power supply" refer to a source of electrical energy, such as a battery, that requires at least two power supply lines to deliver power to an electrical circuit and the word "coupling" requires a voltage potential applied

in the substrate that is different than the voltage potential in the logic gates. With that decision, it appeared that NeoMagic would concede that Trident was entitled to a summary judgment it did not literally infringe the asserted claims of either the '955 or the '806 patents. In addition, with the Court of Appeals for the Federal Circuit's decision in Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 234 F.3d 558 (Fed. Cir. 2000), NeoMagic conceded it could not establish Trident infringed the asserted claims of the '955 patent under the doctrine of equivalents. That left NeoMagic's contention Trident infringed the asserted claims of the '806 patent under the doctrine of equivalents and Trident's denial it infringed and its contentions those claims were invalid.

However, following that decision NeoMagic renewed its motion for a summary judgment of literal infringement, arguing Trident's accused products have two power supplies as those words have been construed by the court. NeoMagic argued Trident's split bias voltage control device in the digital-to-analog converter contained two power supplies within the court's definition.

The capacitor is called a split bias device. It is located in the periphery of the chip in the digital-to-analog converter, which is a part of the display interface circuitry. Its purpose is to convert a quantity specified as a binary number to a voltage or current proportional to the value of the digital input. It is a p-type transistor, formed in an n-well, in a p-type substrate. It is connected to a  $AV_{DD}$  line of a power supply  $AV_{DD}/AV_{SS}$  and a "BIAS" line which is used by the digital-to-analog converter as a control voltage line which changes in magnitude to keep the current sources in the digital-to-analog converter

at a constant value.

NeoMagic argues the split bias capacitor contains two power supplies, the main or first power supply,  $AV_{DD}/BIAS$ , and a second power supply,  $AV_{SS}/BIAS$ , as each is a source of electrical energy that requires at least two power supply lines to deliver power to an electrical circuit

Trident has responded by arguing that BIAS is not part of a power supply, it is a signal line used to control voltage for changing digital to analog signals. It is not located within the graphics engine and has nothing to do with solving the problem of excessive noise.

Trident also argues that  $AV_{SS}/BIAS$  could not be either the first or the second power supplies in claims 7 and 18. Trident argues that the specification of the patent teaches that  $AV_{DD}/AV_{SS}$  supplies power to the logic gates and is the claimed first power supply. The claims require that the second power supply be negative with respect to the first. Trident taps its substrate with  $AV_{SS}$ , which is at zero volts. Therefore, what NeoMagic contends is the second power supply,  $AV_{SS}/BIAS$ , is not negative and is not negative with respect to  $AV_{DD}/BIAS$ .

Trident argues the court should issue a supplemental claim construction to find “capacitor” refers to a device located within the graphics engine and that “first power supply” refers to the power supply that supplies power to the logic gates of the integrated circuits, and that power supply be limited only to regulated or constant voltage power supplies.



In renewing its motion for a summary judgment, Trident also argues the accused products do not infringe under the doctrine of equivalents, as its accused products use a grounded substrate and a triple-well process to isolate memory from the effects of noise, while the claims require tying the substrate to a negative voltage to reverse bias the substrate.

NeoMagic has responded by arguing that there would be no basis for the court to construe the claims to require that the capacitor be located in the graphics engine and that nothing in the claims requires that the definition of power supply be limited to a device that must power the logic circuitry. NeoMagic argues the split bias device is analogous to the on-chip charge pump or substrate bias generator discussed in the '806 patent that is used to generate the negative substrate bias voltage,  $V_{BB}$ , and that Trident's capacitor, the split bias device, has each of the elements of the claims in issue, including a first power supply  $AV_{DD}/BIAS$  and a second power supply  $V_{SS}/BIAS$ . Because  $AV_{DD}$  is at approximately 3.0 volts,  $BIAS$  is between 0 and 3.0 volts, and  $AV_{SS}$  is typically at zero,  $AV_{DD}/BIAS$  will always be higher than  $AV_{SS}/BIAS$ , and therefore  $AV_{SS}/BIAS$  is negative with respect to  $AV_{DD}/BIAS$  in the sense that it is less than it.

Following further argument and interim efforts by the court to resolve these issues, including decisions by the court on the meaning of "negative with respect to" and the location of the capacitor and a suggestion to counsel that the court was reconsidering its construction of the meaning of the words "power supply," the court scheduled and heard further argument and testimony on these matters on Monday, January 22, 2001.

At that hearing, counsel for NeoMagic renewed its argument for a summary judgment of literal infringement, with the argument focused on Trident's split bias device and whether it contained each of the elements of claims 7 and 18 of the patent. Counsel argued that it did. Counsel called one of the inventors Deeprai S. Puar to testify. Puar testified to a number of matters, including how he and Ravi Ranganathan decided to combine logic and DRAM on a substrate in the DRAM process, using a substrate bias voltage,  $V_{BB}$ , a negative voltage. Puar testified that earlier chip designers used an off-chip power source to generate the  $V_{BB}$  negative voltage. More recently, however, chip designers have used an on-chip charge pump, also called a substrate bias generator to generate  $V_{BB}$ , which is described in the patent as reverse biasing the substrate to -1.5 volts. It does that with a series of pulses that progressively biases the substrate voltage down to the design value, which was a negative 1.5 volts at the time of the invention.

Counsel for Trident responded with argument and testimony by Trident's expert, Robert J. Murphy. Murphy reviewed the specification of the patent, the causes of latch-up, the solution advanced by the patent to put memory and logic on one chip or substrate, and how the DRAM process requires reverse biasing the substrate. He described the on-chip pump, the  $V_{BB}$  generator, which is normally set at minus 1.5 volts. He repeated testimony he had previously offered that the invention would not work if the second power supply were at or above zero volts.

NeoMagic responded by calling its expert Joseph C. McAlexander. He testified that the split bias device is a power supply within the definition as previously set out by

the court and that it is similar to the on-chip bias generator. He explained that it receives two inputs,  $AV_{DD}$  and  $AV_{SS}$ , and generates a nominal voltage at around 2.0 to 2.2 volts, which is between  $V_{SS}$  and  $AV_{DD}$ . He also testified that a chip could be designed to work with a substrate biased at zero volts.

## II. DISCUSSION

Summary judgment is proper if no genuine issue of material fact exists and the moving party is entitled to a judgment as a matter of law. See Fed. R. Civ. Pro. 56(c). “[T]he substantive law will determine which facts are material. Only disputes over facts that might affect the outcome of the suit under the governing law will properly preclude summary judgment.” Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 248 (1986). A dispute is genuine “if the evidence is such that a reasonable jury could not return a verdict for the nonmoving party.” Id.; Apple Computer, Inc. v. Articulate Sys., Inc., 234 F.3d 14, 19-20 (Fed. Cir. 2000).

To determine whether Trident infringes the '955 and '806 patents, the court performs a two-step analysis. See Markman v. Westview Instruments, Inc., 52 F.3d 967, 976 (Fed. Cir. 1995) aff'd 517 U.S. 370 (1996). First the court must construe the meaning and scope of the asserted claims. See id. Second, the court must compare the properly construed claims to the accused products to determine whether all of the limitations of the claim are present. See id.

In construing claims, a court should first look to the words of the claims

themselves, both asserted and not asserted, to define the scope of the patented invention. See Pitney Bowes, Inc. v. Hewlett Packard Co., 182 F.3d 1298, 1309 (Fed. Cir. 1999); Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996). A court should give the words of a patent their ordinary and customary meaning absent a patentee's express statement in the patent specification or file history to the contrary. See Vitronics Corp., 90 F.3d at 1582. When a term is unclear in view of all of the intrinsic evidence, a court may use extrinsic evidence, such as expert or inventor testimony, to aid in interpretation of the claims.

Whether a claim encompasses an accused device, either literally or under the doctrine of equivalents, is a question of fact. See North Am. Vaccine, Inc. v. American Cyanamid Co., 7 F.3d 1571, 1574 (Fed. Cir.1993). To establish that it is entitled to summary judgment of infringement, NeoMagic has the burden to demonstrate that Trident's products contain all of the limitations of the claims, either literally, or by a substantial equivalent. See Zelinski v. Brunswick Corp., 185 F.3d.1311, 1316 (Fed. Cir. 1999). Conversely, if Trident demonstrates that any of the claim limitations is absent from its products, there can be no infringement, either literally, or under the doctrine of equivalents. See Glaxo, Inc. v. Novopharm, Ltd., 110 F.3d 1562, 1566 (Fed. Cir. 1997); Dolly, Inc. v. Spalding & Evenflo Cos., 16 F.3d 394, 397 (Fed. Cir. 1994).

A. Is Trident entitled to a summary judgment it does not literally infringe Claims 1 and 2 of the '955 Patent?

The court has construed the term “coupling” in the asserted claims to require a voltage potential applied in the substrate that is different than the voltage potential in the logic gates. As it appears from the papers submitted by the parties, the chips manufactured by Trident apply the same voltage, ground, to both the substrate and the logic gates, the court finds there is no genuine issue of material fact as to infringement and Trident is entitled to a summary judgment of no literal infringement of Claims 1 and 2 of the '955 patent.

B. Is Trident Entitled to a Summary Judgment it does not Literally Infringe Claims 7, 9, 13, 18, 20, 24 and 26 of the '806 patent?

The parties arguments as to whether Trident’s accused products infringe the asserted claims of the '806 patent raise the following three issues: 1) Is  $AV_{SS}/BIAS$  in Trident’s split bias device within the digital-to-analog converter a power supply as those words have been construed by the court; 2) If the  $AV_{SS}/BIAS$  line is a power supply, can it be the second power supply in the claims if it is part of a capacitor structure that is on the periphery of the chip and is not located in the graphics engine; 3) If the  $AV_{SS}/BIAS$  line is a power supply, can it be the second power supply in the patent by being at a negative voltage with respect to the first power supply.

1. Is  $AV_{SS}/BIAS$  in Trident’s split bias device a power supply?

The court has revisited the issue of the proper definition of the words “power supply” and has decided the court was correct to reject NeoMagic’s proposed construction that a power supply is a source connection or line that may be at a particular

voltage level. The court found the words should be given their plain, ordinary meaning as they are commonly understood by one skilled in the art. As argued by Trident, the court found “power supply” refers to a source of electrical energy, such as a battery, that requires at least two power supply lines to deliver power in an electrical circuit.

The issue raised by NeoMagic, in arguing that Trident’s split bias device is a power supply, is that the device appears to fall within the court’s definition, but is not what one of ordinary skill in the art would call a power supply. The split bias device has two or more terminals and is capable of providing power to a circuit. It is analogous to the substrate bias generator, in that it takes power from an off chip source,  $V_{DD}/V_{SS}$ , and modifies the voltage of that power. As described in the patent, the substrate bias generator uses the  $+3.3 V_{DD}$  volts to create the  $-1.5 V_{BB}$  volts. Similarly, the split bias device uses  $V_{DD}/V_{SS}$  to create the voltage BIAS which varies between  $+2.0$  and  $+2.2$ .

The court agrees with Trident that the split bias device is not a power supply within the ordinary meaning of that term. At this stage of the litigation, the court could revisit the subject of the proper construction of the words, or leave the issue to the jury. In leaving it to the jury, it appears that the dispute between the parties would not be whether the device is a power supply in its ordinary sense. Rather, the parties would be disputing whether the device fell within the court’s definition. As the court intended to give power supply its ordinary meaning and as NeoMagic’s argument shows the court has not accomplished this, it is more appropriate for the court to revisit the subject of the definition to insure that the one selected by the court accomplishes the court’s purpose,

which is to construe the claims to require a power supply as understood by one of ordinary skill in the art.

Trident has suggested that it is well-known to one of skill in that art that power supplies are designed and intended to deliver a constant source of power and that some power supplies can come closer to ideal than others. It argues that the court should construe power supply as a “constant voltage power supply.” In advancing that argument Trident notes that there is evidence to show that voltage on the substrate bias generator varies plus or minus 0.5 volts around -1.5 volts. It argues that this definition fairly draws the distinction between the substrate bias generator and the split bias device: the substrate bias generator is designed to produce as constant a voltage as possible, whereas the BIAS line is a signal line used as a control voltage line which changes in magnitude to keep the current sources in the digital-analog-converter at a constant value. Trident offered the testimony and affidavit of Robert J. Murphy to confirm that one of ordinary skill in the art would understand that a substrate bias generator is an on-chip power source that receives its power from the main power supply of the chip and delivers power in a converted form to the substrate. At the same time, one of ordinary skill in the art would not find that a bias or control voltage line is a power supply, as it controls sources of power in a manner to make them constant and independent of both power supply variations and temperature.

The court agrees with Mr. Murphy’s testimony and finds a person of ordinary skill in the art would find the substrate bias generator is a power supply and the BIAS line in

the split bias device is not. To the extent it is necessary to clarify the normal and ordinary meaning of the term, the court will adopt Trident's proposed definition.

Therefore, for the reasons set out by the court in its May 8, 2000 opinion as supplemented by this opinion, the court finds power supply in the asserted claims should refer to a source of electrical energy, such as a battery, that requires at least two power supply lines to deliver a constant voltage supply of power to an electrical circuit.

2. Do the words “negative with respect to” mean the second power supply must be at a negative voltage?

After having considered the matter, the court will also revisit its earlier decision on the words “negative with respect to.” On reviewing the specification, it appears that the inventors' description of their solution for combining logic and memory on one chip by using the DRAM process, necessitated that they design the logic and memory to be on a single p-substrate with a negative tap. The example they give in the patent shows  $V_{BB}$  at -1.5 volts. The testimony and arguments offered by the parties shows that  $V_{SS}$  is typically at zero and that one of ordinary skill in art would typically bias the substrate with a negative  $V_{BB}$ . NeoMagic's arguments to the contrary seem to depart from the specification and to suggest that it is possible to tap a substrate with  $V_{BB}$  at zero or above. There is little basis to believe one of ordinary skill in the art would believe this to be what the claims describe.

It is confusing in this context for one to describe a power supply as “negative with respect to” another. A typical reader would not understand the word “negative” in the



claim was being used to mean “less than.” Rather, a typical person and a person of ordinary skill in the art would read and understand the word negative in this context to mean less than zero. As this use of the word is consistent with the standard practice in the industry of tapping DRAM with a negative voltage and as this is the approach adopted by the inventors, it is reasonable to find the words describe a negative substrate tap, i.e. a substrate tapped with a line at a voltage of less than zero volts. Trident’s split bias device does not have a substrate tap line at a voltage of less than zero volts.

3. Must the Capacitor be located on the graphics engine?

The court is not comfortable with its prior decision on the issue of the location of the capacitor and in light of the decisions on the construction of the terms power supply and “negative with respect to,” finds it need not resolve this issue one way or the other. The court will, therefore, withdraw its prior findings on Trident’s argument as to the location of the capacitor and not reach the issue in this decision.

4. Conclusions

As the court has found that there is no genuine issue of material fact and that the accused Trident products do not contain each of the elements of the asserted claims, in that they do not have a second power supply and what NeoMagic has identified as a second power supply is not negative with respect to the first power supply, the court finds that Trident is entitled to a summary judgment in its favor that its accused products do not literally infringe of claims 7, 9, 13, 18, 20, 24, and 26 of the ’806 patent.

C. Is Trident Entitled to a Summary Judgment it does not infringe Claims 7, 9,

13, 18, 20, 24 and 26 of the '806 patent under the doctrine of equivalents?

Even where an accused product differs enough from the asserted claims so that it does not literally infringe the express terms of the patent, a court may find infringement “if there is equivalence between those elements of the accused product and the claimed elements of the patented invention.” Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co., 520 U.S. 17, 21 (1997). An element of the accused product is equivalent to the claim limitation if the differences between them are “insubstantial.” See Zelinski, 185 F.3d at 1316-17. The Supreme Court has suggested that the issue is “whether under the circumstances the [substitution of one element for another] was so insubstantial that” the doctrine should apply. Graver Tank & Mfg. Co. v. Linde Air Products Co., 339 U.S. 605, 610 (1950). Alternatively, a court could ask whether the element “performs substantially the same function in substantially the same way to obtain the same result as the claim limitation.” See Zelinski, 185 F.3d at 1316-17. The Supreme Court has made clear that either framework is acceptable, so long as the court addresses the “essential inquiry [of whether] the accused product or process contain[s] elements identical or equivalent to each claimed element of the patented invention.” Warner-Jenkinson, 520 U.S. at 39.

The inventors of the '806 patent describe how they solved the problem of combining logic and memory by using the DRAM method and tapping the p-substrate with a negative bias. Trident's accused products may achieve the same result, but they do it in a different way, using a single power supply, a grounded substrate and a triple-well

construction. The court finds that these differences are substantial and, accordingly, the court will grant Trident's motion for a summary judgment its accused products do not infringe claims 7, 9, 13, 18, 20, 24, and 26 of the '806 patent under the doctrine of equivalents.

### III. CONCLUSION

For the reasons stated above, the court finds there is no genuine issue of material fact as to infringement and Trident is entitled to a summary judgment of no literal infringement of Claims 1 and 2 of the '955 patent and is entitled to a summary judgment of no literal infringement or infringement under the doctrine of equivalents of Claims 7, 9, 13, 18, 20, 24, and 26 of the '806 patent.

The court will enter an order in accordance with this opinion.