

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

POLARIS POWERLED
TECHNOLOGIES,
LLC,

Plaintiff,

v.

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

Defendants.

Civil Action No. 2:22-CV-00469-JRG

JURY TRIAL DEMANDED

DECLARATION OF THOMAS L. CREDELLE

I, Thomas Credelle, declare under penalty of perjury as follows:

I. INTRODUCTION AND BACKGROUND

1. I have been retained as an expert witness by Polaris PowerLED Technologies, LLC (“Polaris”) and have been asked to provide my expert opinions regarding U.S. Patent No. 7,259,521 (“the ’521 patent”).

2. In this declaration I provide my independent analysis of the ’521 patent in light of the materials cited below and my knowledge and experience in this field during the relevant time frame. I have been asked to consider what one of

ordinary skill in the art at the time of the invention of the '521 patent (a "POSITA"; refer to Section IV below) would have understood from the specification, including scientific and technical knowledge related to the patent.

3. My findings, as explained below, are based on my study, experience, and background in the fields discussed below, informed by my education in electrical engineering and solid state optics. I have also relied on my review and analysis of prior art, information provided to me, and information that I have independently reviewed.

4. I am being compensated for my independent analysis as an expert at my standard hourly rate of \$500/hour, but my compensation is not contingent in any way on the content of my analysis or the outcome of this case. I have no financial interest in the Plaintiff or the Defendants and I have no financial interest in the challenged patent.

II. QUALIFICATIONS

5. Details of my professional qualifications and background are set out in my *curriculum vitae* (Exhibit A). As shown in my *curriculum vitae*, I have devoted my career to the research and development and product engineering of flat panel displays and materials/optics/electronics for flat panel displays. I have over 20 years of involvement in flat panel display technology including active-matrix LCD R&D, starting in 1983 at RCA Labs and continuing at GE. I led the product

development of active-matrix LCDs for notebook computers at Apple in the early 90's and had close collaboration with many LCD developers in Asia. Later in my career, while at Clairvoyante, I made significant contributions to the design and implementation of new pixel architectures for LCDs and OLEDs; both efforts involved TFT design modifications to achieve the desired goals of high pixel transmission and reduced circuit complexity. More recently, I have been involved in several patent litigation cases which required a detailed knowledge of TFT design and processing.

6. I am currently the President of TLC Display Consulting and have split my time between technical consulting and patent litigation support.

7. I received my M.S. degree in Electrical Engineering from the Massachusetts Institute of Technology in 1970, with an emphasis on Electro Optics and Solid-State Materials. I received my B.S. degree in Electrical Engineering in 1969 from Drexel University.

8. I was employed by RCA at Sarnoff Labs in Princeton, NJ, from 1970 through 1986 at first as a Member of the Technical Staff and later as a Group Manager in charge of all Active Matrix LCD research. During my time at RCA, I participated in research and development projects relating to optical materials and flat panel displays, including LCD devices. In 1983, I established the Thin Film Transistor ("TFT") LCD Program at Sarnoff Labs. As a Group Manager, I led a

project that resulted in the development of the first poly silicon TFT LCD at Sarnoff Labs. I received the Sarnoff Outstanding Achievement Award for Large Area Flat Panel TV Developments.

9. From 1986 to 1991, I was employed by GE as the Manager of TFT LCD Research and Development at the GE Research and Development Center in Schenectady, NY. My duties included contributing to and managing research and development efforts relating to TFT and LCD technology for avionics applications. While employed by GE, I led the team that built the world's first 1-million-pixel color LCD device. I also led the development of numerous other display devices utilizing LCD technology.

10. From 1991 to 1994, I was employed by Apple Computer as the Manager of Display Engineering. In my role at Apple, I supervised all TFT-LCD design (in-house and at vendors), engineering, and qualification for the first PowerBook notebook computers introduced to market in the United States. A key part of my effort was the evaluation and development of active matrix LCDs with improved performance, such as viewing angle, contrast ratio and uniformity and backlight control.

11. From 1994 to 1996, I was employed as the Director of Advanced Product Marketing by Allied Signal, where I was involved with the design and

engineering of optical films and custom focusing LED backlight designs for improving the viewing angle performance of LCD devices.

12. From 1996 to 1999, I was employed as the Director of Product Marketing for Motorola's Flat Panel Display Division, where I worked in the development of new flat panel technology, and I also worked closely with Motorola groups responsible for integrating TFT-LCD technology into mobile phone products.

13. From 1999 to 2001, I served as the Vice President of Operations of Alien Technology Corporation. During my time at Alien Technology, I was involved with the design and architecture of drive electronics packaging technology suitable for flexible LCD devices.

14. From 2001 to 2007, I served as the Vice President of Engineering for Clairvoyante, Inc. My responsibilities as the VP of Engineering included managing research, development, engineering, and marketing of technologies for improving the resolution and power consumption of color flat panel displays, which required significant changes to the TFT-LCD layout and LED backlight. During my time at Clairvoyante, I was therefore heavily involved with the design of the active-matrix array and the LCD driving circuitry. My work resulted in the issuance of multiple patents relating to TFT-LCD and TFT-OLED display technology.

15. From 2007 to 2008, I served as the Senior VP of Engineering for Puredepth, Inc. My responsibilities included the design of hardware and software to create 3D images on TFT-LCDs. Hardware included a high-brightness, high power LED backlight source that had to survive in slot machines 24/7. LED backlight controllers were an important part of this development work.

16. From 2008 to 2012, I served as VP Engineering at Display Engineering, a company founded to design and sell high-brightness LED-LCDs for outdoor use. Commercial LCD displays were converted to high brightness through a complete redesign of the LED backlight, LED driving circuits, and LED cooling. LED controllers were selected based on the requirements of the newly engineered LED backlights, which were based on strings of LEDs.

17. From 2012 through 2015, I served as the Vice President of Application Engineering and Device Performance for Innova Dynamics, Inc., a nanotechnology company developing materials to be used in LCDs and touch sensors. In 2008, I founded TLC Display Consulting, a company that provides technical consulting in the areas of flat panel displays, liquid crystal displays, and related electronics. I currently serve as the President of TLC Display Consulting.

18. I have been an active member of the Society for Information Display (“SID”) for over 40 years, having attended almost every SID Annual Technical Symposium since 1972. I was a member of the Society for Information Display’s

Program Committee for 15 years, and the Director of the Society for Information Display's Symposium Committee for 10 years. In 1984, I was awarded the title of Fellow of the Society for Information Display in recognition of my achievements and contributions to flat panel display technology.

19. I am a named inventor on over 80 US patents relating to flat panel display and LCD technology. I have also authored several articles relating to LCD technology and flat panel displays that were published by industry periodicals such as Information Display and peer reviewed journals such as the Society for Information Display's Digest of Technical Papers.

20. Because of my background, training, and experience, I am qualified as an expert in the technical areas relevant to the '521 patent.

III. MATERIALS CONSIDERED

21. In preparing this declaration, I have considered the claims, specification, and prosecution history of the '521 patent. As part of my analysis for this Declaration, I have considered my own knowledge and experience, including my work and experience with LCDs and OLEDs.

IV. PERSON OF ORDINARY SKILL IN THE ART ("POSITA")

22. I understand that the teaching of the prior art is viewed through the eyes of a POSITA. Counsel for Polaris has informed me that a person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant

art at the time of the invention. In my opinion, the relevant field of art for the patents-in-suit is that of electrical engineering and display technologies. I have also been informed by counsel for Polaris that the person of ordinary skill is generally familiar with the type of problems encountered in the field and the prior art solutions to those problems and possesses an ordinary level of creativity.

23. For the purpose of this declaration, I believe a POSITA would have had at least a bachelor's degree in electrical or computer engineering, or an equivalent area with 2-3 years of experience in the field of driving circuitry for active matrix displays. An advanced graduate degree in the disciplines cited above may make up for the work experience indicated above.

V. BACKGROUND OF THE '521 PATENT

A. Summary

24. The '521 patent, titled "Video driver architecture for AMOLED displays" issued on August 21, 2007, and was filed as application no. 11/467,738 on August 28, 2006. '521 patent, (21), (22), (45).

B. AMOLED Displays and Power Supply Voltage Variations

25. The '521 patent is directed to active-matrix organic light emitting diode (AMOLED) displays. '521 patent, 1:13-17. The '521 patent sets forth by way of background that "An AMOLED display panel contains many thousands of individual pixel drivers which provide current to energize the individual pixel

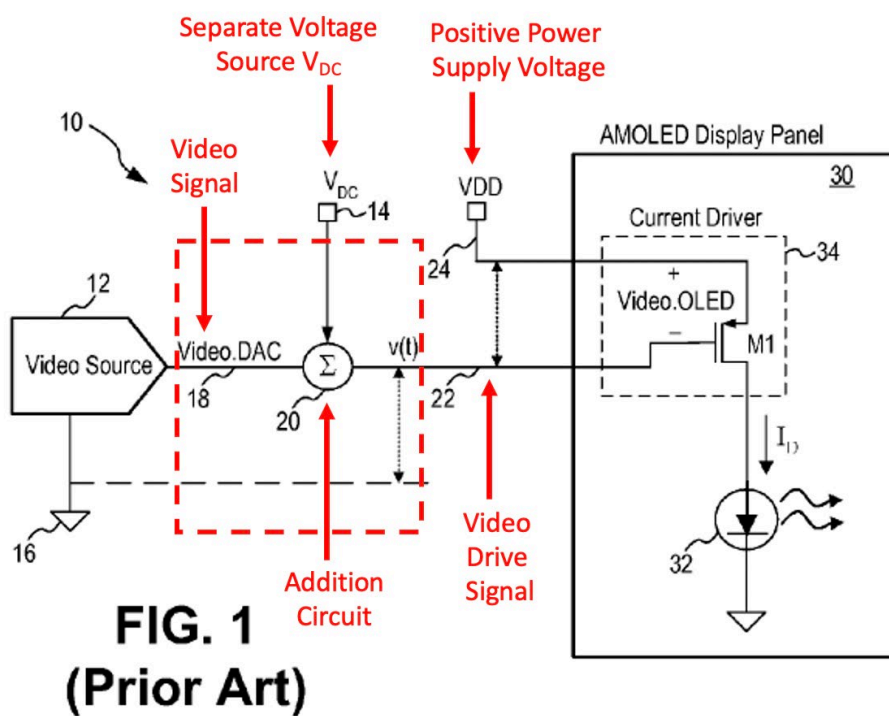
OLEDs.” *Id.*, 1:15-17. “These pixel drivers are programmed by a single current driver via a series of row and column decoders and switches such that, at any instant, only one pixel is connected to the current driver. The input to the current driver is the video drive signal.” *Id.*, 1:17-21. It should be noted that the pixel driver described in the ’521 patent comprises a single TFT for purposes of illustration of the basic principles of the invention. The same principles apply even with additional compensation TFTs added to the circuit.

26. “The current provided by the current driver is proportional to the difference between the voltage level of the video drive signal and the positive power supply voltage of the display panel.” *Id.*, 1:22-25. Therefore, variations in the power supply voltage will modulate the brightness of the AMOLED display, causing the display to flicker. *Id.*, 1:25-32. “The direct relationship between the drive current and the power supply voltage renders AMOLED displays extremely sensitive to power supply voltage noise.” *Id.*, 1:32-35. “In particular, when the AMOLED display is incorporated in a battery powered application, the power supply voltage will inevitably fluctuate whenever circuitry in the application device is powered up from being in a standby mode.” *Id.*, 1:41-45. “For example, the AMOLED display may be incorporated in a cellular telephone where the battery voltage is coupled to a voltage regulator to provide the power supply voltage for the AMOLED display system. The power supply voltage will fluctuate

when the transmitter or receiver circuit is powered up. Furthermore, battery voltage tends to drift over time.” *Id.*, 1:45-51.

C. Prior Art

27. The '521 patent illustrates the problems of the prior art in its discussion of Figure 1, a schematic diagram of an exemplary prior art AMOLED display system.



Id., FIG. 1 (annotated).

28. In Figure 1, video source 12 provides video signals to the AMOLED display panel. *Id.*, 1:56-59. The video signal, e.g., Video.DAC, is added to a DC voltage source, V_{DC} , at summing circuit 20, generating the video drive signal, $v(t)$. *Id.*, 1:65-2:1. The video signal Video.DAC is referenced to ground and adding it to

V_{DC} brings the analog video signal to within the range of the AMOLED display panel. *Id.*, 2:1-14. The result is that video drive signal $v(t)$ is referenced to the ground voltage and its voltage value is given in the following equation:

$$\text{Eq. (1) } v(t) = \text{Video.DAC} + V_{DC}$$

Id., 2:6.

29. At the AMOLED display panel 30, the video drive signal $v(t)$ is coupled with Current Driver 34, which is implemented as a PMOS transistor, M1. *Id.*, 2:15-17, 2:23-27. The gate of PMOS transistor M1 is connected to the video drive signal $v(t)$ and the source (mistakenly identified as drain in the specification) ~~drain~~ is connected to power supply VDD. *Id.*, 2:23-27. The drive current I_D at the OLED pixel, 32, is a function of Video.OLED, the voltage across the source ~~drain~~ and gate terminals of transistor M1. *Id.*, 2:28-30. Voltage Video.OLED is referenced to the power supply voltage VDD and is given as the following equation:

$$\text{Eq. (2) } \text{Video.OLED} = VDD - v(t)$$

Id., 2:37.

30. The power supply voltage VDD of the AMOLED display panel will have variations due to voltage glitches, noise, or drifts. '521 patent, 2:38-41. The power supply voltage VDD can be described as the sum of an ideal power supply voltage VDDI and drift and noise components, given as the following:

$$\text{Eq. (3) } V_{DD} = V_{DDI} + V_{\text{drift}} + V_{\text{noise}}$$

Id., 2:41-46.

31. The voltage Video.OLED at the display panel can be re-written by substituting $v(t)$ from Equation (1) and V_{DD} from Equation (3) into Equation (2).

Id., 2:47-49. The Voltage V_{DC} will not necessarily suffer from the same noise and drift issues as the power supply voltage V_{DD} and is therefore assumed to have the same voltage as the ideal voltage V_{DDI} (i.e., $V_{DC} = V_{DDI}$). *Id.*, 2:50-53. The current driver voltage Video.OLED can be given as:

$$\begin{aligned} \text{Eq. (4) } V_{\text{Video.OLED}} &= V_{DD} - v(t) \\ &= V_{DDI} + V_{\text{drift}} + V_{\text{noise}} - V_{\text{Video.DAC}} - V_{DDI} \\ &= V_{\text{drift}} + V_{\text{noise}} - V_{\text{Video.DAC}} \end{aligned}$$

Id., 2:53-60.

32. As can be observed in Equation (4), variations in the voltage V_{DD} (V_{drift} and V_{noise}) directly impact voltage Video.OLED, which determines the drive current I_D at the OLED pixel. *Id.*, 2:63-67. As a result, voltage variations in the power supply cause variations in the brightness of the AMOLED display. *Id.*, 2:67-3:4.

D. '521 Patent – First Embodiment

33. The '521 patent addresses the problem of power supply voltage variations by utilizing a separate video driver circuit distinct from the AMOLED

display that references the video drive signal to the power supply voltage instead of to ground, as illustrated by Figure 2. *Id.*, 3:8-23. The result is that any variations in the power supply voltage will cancel out at the current driver and the current I_D driving the OLED pixel will be unaffected by variations in the positive power supply voltage. *Id.*, 3:58-67.

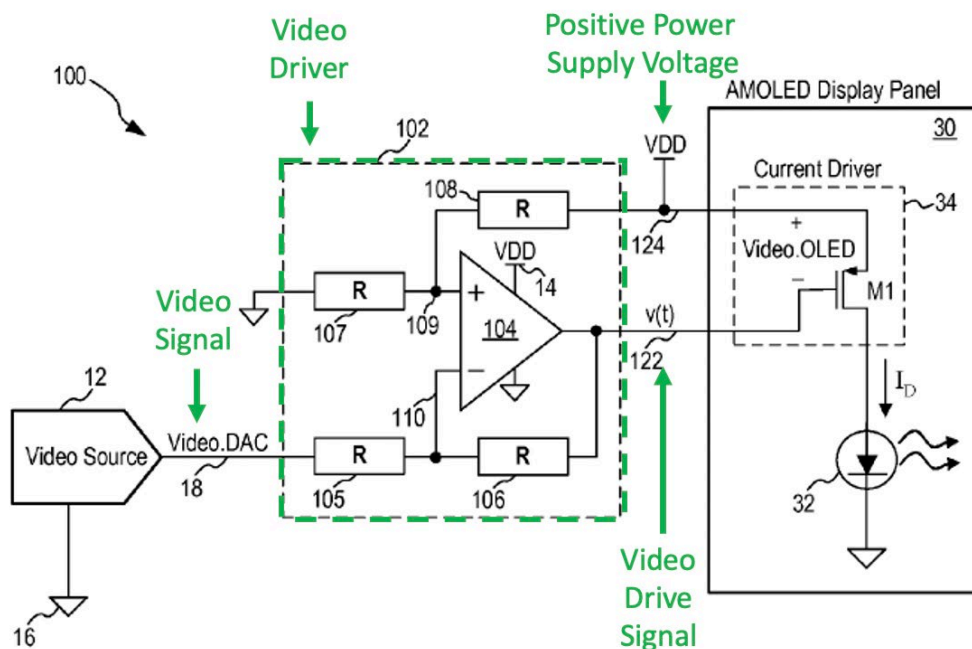


FIG. 2

Id., FIG. 2 (annotated).

34. Although the video driver is distinct from the AMOLED display panel, it receives the power supply voltage VDD as an input. *Id.*, FIG. 2. The video driver includes a differential amplifier circuit that uses the power supply voltage VDD rather than a separate voltage source (e.g., V_{DC} in Figure 1) to generate the video drive signal. *Id.*, 4:34-36. Video signal Video.DAC (18), which is referenced

to ground, and VDD are fed into the positive and negative inputs, respectively, of operational amplifier (opamp) 104. *Id.*, FIG. 2, 4:55-60. The opamp outputs video drive signal $v(t)$, which is the difference in voltage between Video.DAC and VDD, resulting in the referencing of the video drive signal to VDD rather than to ground. *Id.*, 4:60-67. Because VDD is connected to the positive input terminal of the opamp, when the voltage of VDD varies, the voltage of $v(t)$ also varies in such a way as to track the power supply voltage variations. *Id.*, 4:60-65. The video drive signal $v(t)$ is expressed in the following equation:

$$\text{Eq. (5)} \quad v(t) = \text{VDD} - \text{Video.DAC}$$

Id., 4:65-55:1.

35. When the video drive signal $v(t)$ is applied to the drive transistor M1, the current drive voltage signal Video.OLED at the current driver is provided in the following equation:

$$\begin{aligned} \text{Eq. (6)} \quad \text{Video.OLED} &= \text{VDD} - v(t) \\ &= \text{VDD} - \text{VDD} + \text{Video.DAC} \\ &= \text{Video.DAC} \end{aligned}$$

Id., 5:6-15.

36. As can be observed from Equation (6), the current drive voltage signal Video.OLED is independent of the power supply voltage VDD. *Id.*, 5:18-23. Thus, any noise or drifts in the power supply voltage VDD will not disturb the current

drive signal and will not affect the brightness of OLED pixel element 32. *Id.*, 5:20-23.

E. '521 Patent – Second Embodiment: Current Mode Isolator Circuit

37. In a second embodiment, the '521 patent discloses a video driver implemented as a current mode isolator circuit, depicted in Figure 3. *Id.*, 5:46-47.

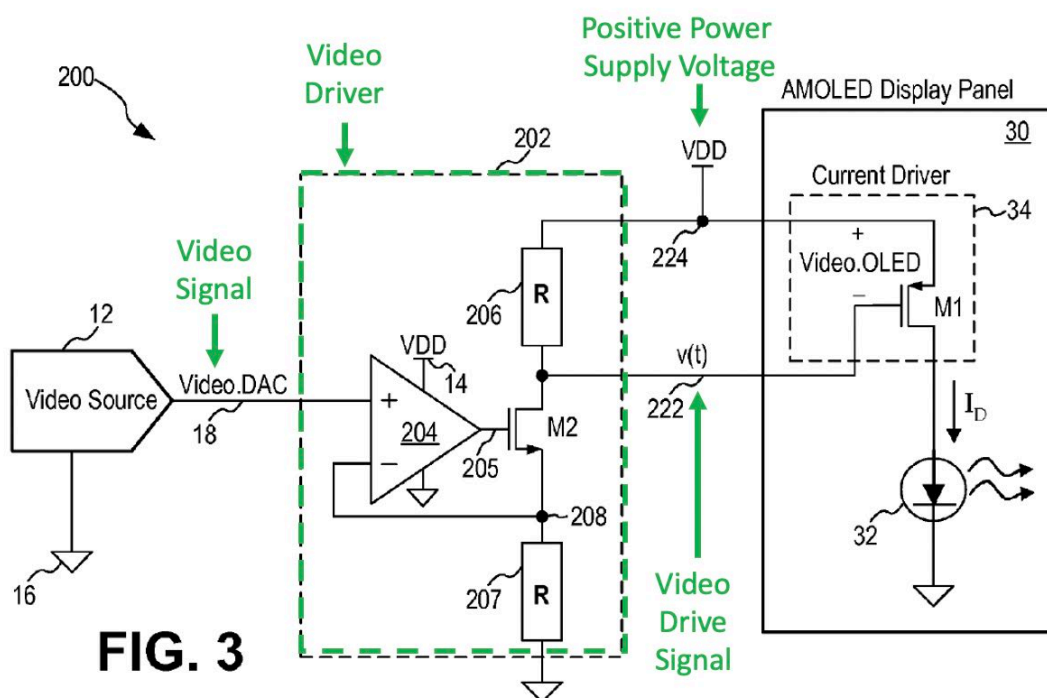


FIG. 3

Id., FIG. 3 (annotated).

38. As in the previous embodiment, the video driver 202 is distinct from the AMOLED display panel and receives the power supply voltage VDD as an input. *Id.*, FIG. 3. “Video driver 202 includes an opamp 204 having a positive input terminal receiving the video signal Video.DAC and a negative input terminal receiving the video signal Video.DAC and a negative input terminal connected in a feedback configuration.” *Id.*, 5:47-50. The output of opamp 204 is

coupled to the gate of NMOS transistor M2. *Id.*, 5:50-52. Resistor 206 is connected between the power supply voltage VDD and the source terminal of transistor M2. *Id.*, 5:52-54. Resistor 207 is connected between the drain terminal of transistor M2 and the ground voltage. *Id.*, 5:55-57. The combination of opamp 204 and transistor M2 forms a transconductance amplifier where the voltage of the video signal Video.DAC is converted to a current at transistor M2 and load resistor 207. *Id.*, 5:60-63. The current that passes through transistor M2 flows through resistor 206 which is referenced to the power supply voltage VDD. *Id.*, 5:63-65. In this manner, the current is converted to the voltage signal v(t) at node 222 which is referenced to the power supply voltage VDD through the resistive load of resistor 206. *Id.*, 5:38-6:44, FIG. 3.

VI. CLAIM TERMS

- A. “a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the AMOLED display panel”**

Term	Polaris PowerLED’s Proposed Construction	Samsung’s Proposed Construction
“a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the	Plain and ordinary meaning	“a video driver receiving the video signal and receiving a positive power supply voltage of the AMOLED display panel as an input and generating a video drive signal indicative of the video signal based on the positive power supply voltage”

Term	Polaris PowerLED's Proposed Construction	Samsung's Proposed Construction
AMOLED display panel" (‘521 Patent, claim 1)		

39. Defendants have yet to provide a substantive rationale for their proposed construction. I reserve the right to submit a supplemental declaration on this issue if Defendants detail their basis for their proposed construction in their claim construction brief or expert's declaration.

40. Defendants' proposed construction seeks to add the requirement that the video driver "receive[] a positive power supply voltage of the AMOLED display panel as an input" to the language of the claim. This requirement is contrary to the plain and ordinary meaning of the claim term. A POSITA would understand that the claimed video driver does not need to receive the positive power supply voltage of the AMOLED display panel in order to reference the video drive signal to the positive power supply voltage. For example, the video driver could use a signal that provides information about the value of the positive power supply voltage in order to reference the video drive signal to the positive power supply voltage.

41. The specification's discussion of the embodiments depicted in Figs. 2-4 does not indicate that the claimed invention requires the video driver to receive

the AMOLED display panel's positive power supply voltage as an input. The specification clearly refers to these examples as embodiments, not limitations on the claimed invention:

FIG. 2 is a schematic diagram of a video driver for an AMOLED display system **according to a first embodiment** of the present invention.

...

FIG. 3 is a schematic diagram of a video driver for an AMOLED display system **according to a second embodiment** of the present invention.

...

FIG. 4 is a schematic diagram of a video driver for an AMOLED display system **according to a third embodiment** of the present invention.

Id., 4:8-10, 5:38-40, 6:45-47 (emphasis added).

42. Additionally, Defendants have cited passages from my declarations submitted in the pending *Inter Partes* Review to support their proposed construction. However, each of the sections of my declarations cited by Defendants merely discuss the '521 patent's embodiments. In these discussions I explicitly refer to the embodiments, as shown below:

D. '521 Patent – First Embodiment

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69. Although the video driver is distinct from the AMOLED display panel, it receives the power supply voltage VDD as an input. EX1001, FIG. 2.

...

E. '521 Patent – Second Embodiment: Current Mode Isolator Circuit

...

73. **As in the previous embodiment**, the video driver 202 is distinct from the AMOLED display panel and receives the power supply voltage VDD as an input. EX1001, FIG. 3.

...

F. '521 Patent – Third Embodiment: Video Clamp Circuit

...

75. **As in the other embodiments**, the video driver 302 is distinct from the AMOLED display panel and receives the power supply voltage VDD as an input. EX1001, FIG. 4.

IPR2022-00771, EX2011, 40, 42, 44 (emphasis added); *see also* IPR2022-00771, EX2001, 23, 25, 27.

43. As can be seen from the statements above, I was discussing the '521 patent's embodiments, not the claimed invention.

B. “AMOLED display panel”

Term	Polaris PowerLED's Proposed Construction	Samsung's Proposed Construction
“AMOLED display panel” (‘521 Patent, claim 1)	Plain and ordinary meaning, i.e., “Active Matrix Organic Light Emitting Diode display panel”	“display containing many thousands of individual OLED pixel elements having corresponding pixel circuits that are programmed with a stored voltage via a series of row and column decoders and switches”

44. Defendants have yet to provide a substantive rationale for their proposed construction. I reserve the right to submit a supplemental declaration on this issue if Defendants detail their basis for their proposed construction in their claim construction brief or expert's declaration.

45. Consistent with the understanding of a POSITA, the specification explains that an “AMOLED display panel” is an Active Matrix Light Emitting

Diode display panel: “Active matrix organic light emitting diode (AMOLED) displays are an emerging flat panel display technology.” ’521 patent, 1:13-14.

46. Defendants’ proposed construction imports additional language from the specification’s “Description of The Related Art” section, which provides a background of the relevant technology. *Id.*, 1:10-3:4. Defendants’ proposed construction incorporates language from the following passage:

Active matrix organic light emitting diode (AMOLED) displays are an emerging flat panel display technology. An AMOLED display panel contains many thousands of individual pixel drivers which provide current to energize the individual pixel OLEDs. These pixel drivers are programmed by a single current driver via a series of row and column decoders and switches such that, at any instant, only one pixel is connected to the current driver. The input to the current driver is the video drive signal.

Id., 1:13-21.

47. A POSITA would understand that the above discussion does not describe the inventions claimed by the ’521 patent. Instead, it merely provides a background discussion of AMOLED displays. This passage describes a conventional AMOLED display panel where a single data driver (referred to as a current driver) supplies drive signals to all the pixels within the pixel array using row and column decoders. This section of the specification does not discuss any of the improvements upon conventional AMOLED display technology provided by the inventions of the ’521 patent.

48. Additionally, the specification elsewhere describes an embodiment of the patented invention as having “a plurality of” rather than “many thousands of” pixel elements:

According to one embodiment of the present invention, an active matrix organic light emitting diode (AMOLED) display system, including an AMOLED display panel receiving a video signal to be displayed on the AMOLED display panel where **the AMOLED display panel includes a plurality of organic light emitting diode (OLED) pixel elements**, includes a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the AMOLED display panel, and a current driver coupled to at least one OLED pixel element Where the current driver receives the video drive signal and the positive power supply voltage and provides a drive current to the at least one OLED pixel element.

Id., 3:8-21 (emphasis added). Therefore, the specification does not require the claimed AMOLED display panel to have “many thousands of individual OLED pixel elements.” This is consistent with the understanding of a POSITA, who would understand that the number of pixels is irrelevant to whether a display panel is an AMOLED display panel.

C. “video signal”

Term	Polaris PowerLED’s Proposed Construction	Samsung’s Proposed Construction
“video signal” (‘521 Patent, claims 1, 2, 3, 5, 7)	Plain and ordinary meaning, i.e., “signal representing video data”	“analog signal representing converted video data”

49. Defendants have yet to provide a substantive rationale for their proposed construction. I reserve the right to submit a supplemental declaration on this issue if Defendants detail their basis for their proposed construction in their claim construction brief or expert's declaration.

50. A POSITA would understand the plain and ordinary meaning of the term "video signal" to mean a "signal representing video data." The term "video signal" by itself without additional restrictions or modifiers can refer to either a digital or analog signal.

51. Consistent with the understanding of a POSITA, the '521 patent's specification states that a video signal can be either digital or analog:

FIG. 1 is a schematic diagram of an exemplary AMOLED display system. In an AMOLED display system 10, a video source 12 provides a source of video signals to an AMOLED display panel 30 to be displayed. Video source 12 can be any system that generate video signals to be displayed, such as an image processor. In most systems, the video signals are digital in nature and the final processing step of video source 12 is to convert the digital video signals to analog signals, thereby generating the analog signal Video.DAC on an output bus 18.

Id., 1:56-65 (emphasis added).

52. In the embodiments depicted in Figs. 2-4, the specification refers to the video signal that is supplied to the video driver as "video signal ***Video.DAC***," which has been converted from digital to analog. Figs. 2-4, 1:63-65, 2:9-12, 4:18-19, 4:49, 4:66-67, 5:42, 5:49, 5:61-62, 6:52, 7:2-3, 7:5-6 (emphasis added). Claim 1, however, does not recite "video signal ***Video.DAC***" but rather simply recites

“video signal” with no additional restrictions or modifiers. Therefore, a POSITA would understand that the “video signal” recited in claim 1 is entitled to its plain and ordinary meaning, which is a signal representing video data with no further limitations.

D. “the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current”

Term	Polaris PowerLED’s Proposed Construction	Samsung’s Proposed Construction
“the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current” (‘521 Patent, claim 1)	Plain and ordinary meaning	Indefinite

53. Defendants have yet to provide a substantive rationale for why Defendants contend this claim term is purportedly indefinite. I reserve the right to submit a supplemental declaration on this issue if Defendants detail their basis for their indefiniteness theory in their claim construction brief or expert’s declaration.

54. A POSITA would understand the phrase “the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current” with reasonable certainty because the phrases “current driver,” “video drive signal,” “positive power supply voltage,” and “drive current” are used on numerous occasions throughout the specifications. In addition, the structure and

operation of a current driver are clearly described in connection with the “video drive signal,” “positive power supply voltage,” and “drive current” in the specification. For example, in the first embodiment of the present invention, a current driver is shown as item **34** in Figure 2 (highlighted in green below):

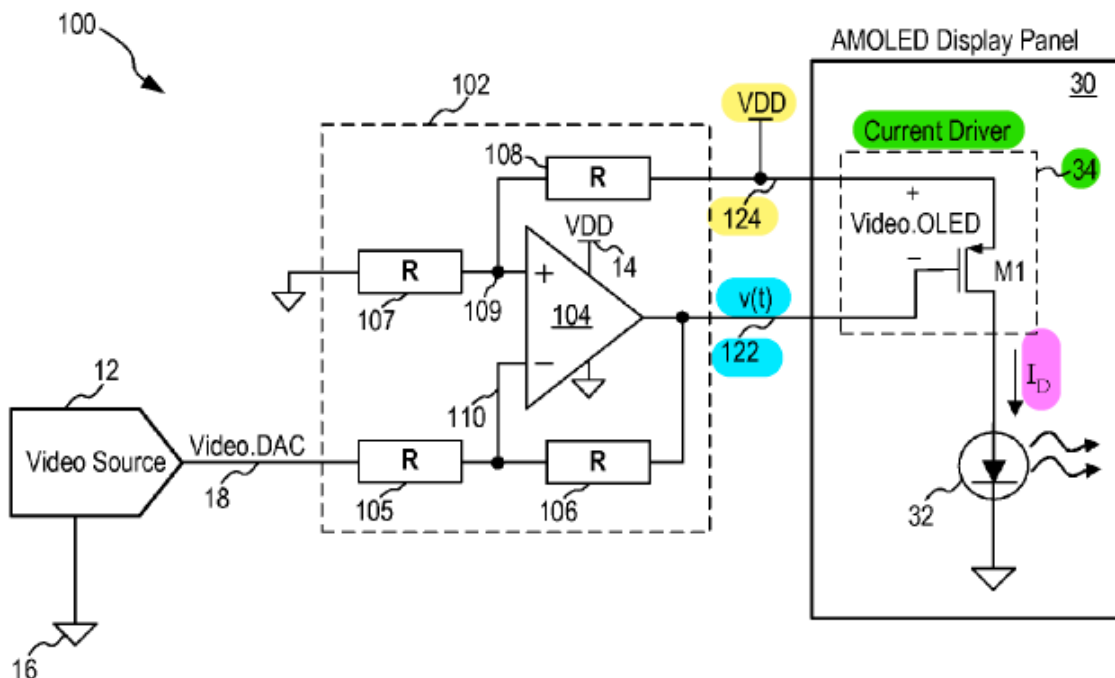


FIG. 2

'521 patent, FIG. 2 (annotated).

55. As described in the specification, “[t]he current driver **34** in AMOLED display panel **30** receives the video drive signal $v(t)$ (node **122**) from the video driver **102** and the power supply voltage VDD (node **124**) and generates a drive current I_D as a function of the current driver voltage signal Video.OLED.” *Id.*, 4:19-24. For clarity, I have annotated Figure 2 to show the current driver **34** in green, the video drive signal $v(t)$ (node **122**) in blue, the power supply voltage

VDD (node **124**) in yellow, and the drive current I_D in purple. A POSITA would understand this teaching as an example of “the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current.”

56. Similarly, in the second embodiment of the present invention, another example of the current driver is described to be receiving the video drive signal $v(t)$ **322** and the positive power supply voltage VDD **324** and providing a drive current I_D . *Id.*, Figure 3, 5:38-46. Because of these clear descriptions of the structure and operation of the current driver in connection with the “video drive signal,” “positive power supply voltage,” and “drive current” in the specification, A POSITA would have no trouble interpreting the claim term “the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current.”

E. “independent of the positive power supply voltage”

Term	Polaris PowerLED’s Proposed Construction	Samsung’s Proposed Construction
“independent of the positive power supply voltage” (‘521 Patent, claim 1)	Plain and ordinary meaning	Indefinite

57. Defendants have yet to provide a substantive rationale for why Defendants contend this claim term is purportedly indefinite. I reserve the right to

submit a supplemental declaration on this issue if Defendants detail their basis for their indefiniteness theory in their claim construction brief or expert's declaration.

58. A POSITA would understand the phrase “independent of the positive power supply voltage” with reasonable certainty because this phrase or the phrase “independent of the power supply voltage VDD” is used many times in the specifications. In addition, the concept of being “independent of the positive power supply voltage” is clearly explained in the specification. For example, in the first embodiment, the specification states:

“As can be observed from Equation (6), the current drive voltage signal Video.OLED is made to be **independent of the power supply voltage** VDD. Thus, any noise or DC drifts in 20 the power supply voltage VDD (node **124**) will not disturb the current drive signal Video.OLED and will not affect the brightness of the AMOLED display.”

Id., 5:18-23 (emphasis added). A POSITA would understand this teaching to be one example of how the current drive voltage signal Video.OLED is made to be “independent of the positive power supply voltage.”

59. Similarly, in the second embodiment of the present invention, the specification states:

“Then, in the same manner as Equation (6) above, when the video drive signal $v(t)$ is applied to the current driver 34 for the OLED pixel element 32, the current drive voltage signal Video.OLED at the current driver 34 becomes:

$$\text{Video.OLED} = \text{VDD} - v(t)$$

$$= VDD - VDD + \text{Video.DAC}$$

$$= \text{Video.DAC}$$

Thus, the current drive voltage signal Video.OLED is made to be **independent of the power supply voltage** VDD. Any noise or DC drifts in the power supply voltage VDD (node 224) will not disturb the current drive signal Video.OLED and will not affect the brightness of the AMOLED display.”

Id., 6:20-37 (emphasis added). A POSITA would understand this teaching to be another example of how the current drive voltage signal Video.OLED is made to be “independent of the positive power supply voltage.”

60. Because of these clear descriptions of how the current drive voltage signal Video.OLED is made to be “independent of the positive power supply voltage,” A POSITA would have no trouble interpreting the phrase “independent of the positive power supply voltage.”

F. “[the sum of or] the difference between the positive power supply voltage and the video [drive] signal”

Term	Polaris PowerLED’s Proposed Construction	Samsung’s Proposed Construction
“[the sum of or] the difference between the positive power supply voltage and the video [drive] signal” (“521 Patent, claim 2)	Plain and ordinary meaning	“[an addition of or] a subtraction between the positive power supply voltage and the video [drive] signal, which are of the same type”

61. Defendants have yet to provide a substantive rationale for their proposed construction. I reserve the right to submit a supplemental declaration on this issue if Defendants detail their basis for their proposed construction in their claim construction brief or expert's declaration.

62. Defendants' proposed construction replaces the terms "sum of" and "difference between" with "an addition of" and "a subtraction between," respectively. Defendants' proposed construction does not make these terms more understandable. For example, the '521 patent specification discloses that "[w]hen the resistance 40 values of resistors **206** and **207** are the same, the current mode isolator circuit has unity gain. If some gain or attenuation is desired, then different resistance values for resistors **206** and **207** can be used, as is understood by one of ordinary skill in the art." *Id.*, 6:39-44. When R206 is different from R207, the output video drive signal voltage $v(t)$ will not be a simple subtraction between the positive power supply voltage VDD and the video signal Video.DAC but will be "indicative of the difference between the positive power supply voltage and the video signal." Defendants' proposed construction also adds the phrase "which are of the same type." This construction seems to require the positive power supply voltage and the video drive signal to be of the same "type" of voltage, which is not a concept discussed in the '521 patent's specification. A POSITA might refer to

alternating current (AC) and direct current (DC) as “types” of voltage. However, this is not relevant to the claims of the ’521 patent.

G. “current mode isolator circuit”

Term	Polaris PowerLED’s Proposed Construction	Samsung’s Proposed Construction
“current mode isolator circuit” ('521 Patent, claim 5)	Plain and ordinary meaning	Indefinite

63. Defendants have yet to provide a substantive rationale for why Defendants contend this claim term is purportedly indefinite. I reserve the right to submit a supplemental declaration on this issue if Defendants detail their basis for their indefiniteness theory in their claim construction brief or expert’s declaration.

64. A POSITA would understand the phrase “current mode isolator circuit” with reasonable certainty because this phrase is used many times in the specifications. In addition, the structure and operation of a “current mode isolator circuit” are clearly described in the specification. For example, the specification states:

FIG. 3 is a schematic diagram of a video driver for an AMOLED display system according to a second embodiment of the present invention. Referring to FIG. 3, a video driver 202 is incorporated in an AMOLED display system 200 for receiving input video signals Video.DAC from a video source 12 and providing a modified video drive signal $v(t)$ for driving the current driver 34 in the AMOLED display panel 30, in the same manner as video driver 102 in FIG. 2. **In the present embodiment, video driver**

202 is implemented as a current mode isolator circuit. Video driver 202 includes an opamp 204 having a positive input terminal receiving the video signal Video.DAC and a negative input terminal connected in a feedback configuration. The output terminal 205 of opamp 204 is coupled to drive an NMOS transistor M2. A resistor 206 is connected between the power supply voltage VDD (node 224) and the source terminal (node 222) of transistor M2, Which also provides the video drive signal $v(t)$. A resistor 207 is connected between the drain terminal (node 208) of transistor M2 and the ground voltage. The negative input terminal of opamp 204 is also connected to the drain terminal (node 208) of transistor M2) to from the feedback loop.

Id., 5:38-59 (emphasis added). A POSITA would understand that video driver 202 of FIG. 3 illustrates an example of a “current mode isolator circuit.”

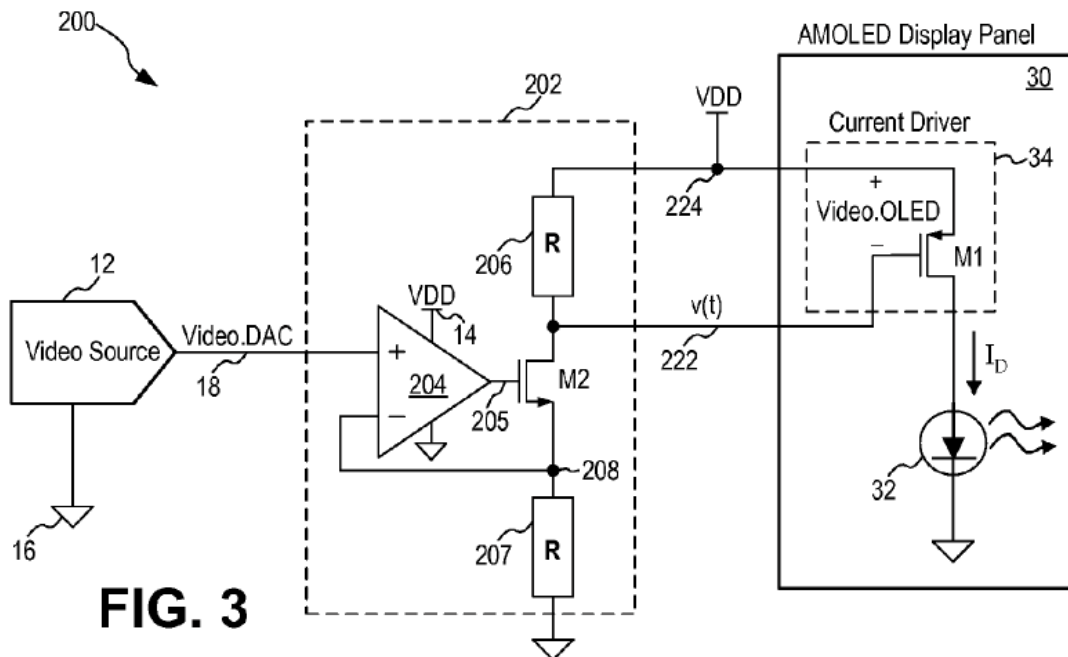
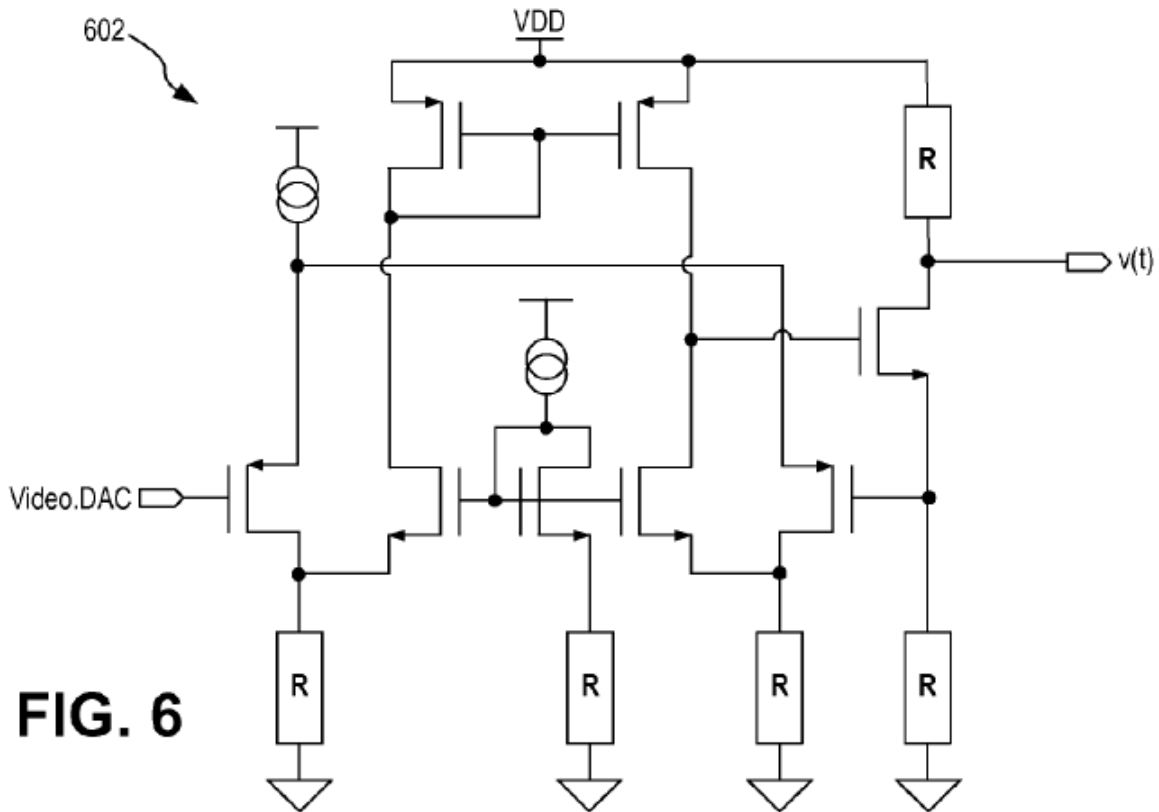


FIG. 3

'521 patent, FIG. 3.

65. The specification includes an additional example, stating: “FIG. 6 illustrates an exemplary implementation of a current mode isolator circuit as the video driver in an integrated circuit.” *Id.*, 8:8-10.



'521 patent, FIG. 6.

A POSITA would understand that Figure 6 illustrates an example of a “current mode isolator circuit.”

66. Because of this clear description of the structure and operation of a “current mode isolator circuit,” A POSITA would have no trouble interpreting this claim term.

VII. CONCLUSION

67. This declaration reflects my opinions as currently held. However, my analysis may continue such that I may consider additional information that may result in additional observations.

68. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the U.S. Code.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on February 23, 2024 in Washougal, WA.



Thomas L. Credelle

EXHIBIT A

Thomas L. Credelle Curriculum Vitae

Professional Summary

Mr. Credelle is a recognized expert in the flat panel/touch industry with over 40 years of expertise in all aspects of flat panel displays, LEDs, LED displays, and optics. He has made significant contributions in the areas of R&D, engineering, marketing, and senior management. He has served at an executive level at start-up businesses within major corporations and start-up companies in Silicon Valley and has had extensive interaction with flat panel producers and customers in Japan, Taiwan, Korea and China. Mr. Credelle holds 84 issued US patents in various flat-panel related technologies including display design, display electronics, materials, algorithms, systems, RFID, and optics, with additional pending.

Mr. Credelle is a Fellow of the Society for Information Display and currently consults regarding technology, business, and patent issues involving Flat Panel Display and LED Technology for various companies. He has written expert-analysis reports for private clients on patent portfolios of over 500 patents and has written numerous IPR ITC, and District Court Case reports and has given depositions on many. He has testified in two District Court cases and two ITC Hearings.

Expertise

- Flat Panel Display Technology
- LEDs and LED lighting
- Display electronics
- Electro-optics
- Patent analysis
- Expert witness (reports, testimony)
- TFT and Liquid Crystal Display R&D

Education

<u>Year</u>	<u>College or University</u>	<u>Degree</u>
1970	Massachusetts Institute of Technology	M.S., Electrical Engineering Emphasis: Electro-optics and Solid State Physics Thesis: "Optical Properties of High Purity Stannic Oxide"
1969	Drexel University	B.S., Electrical Engineering (Honors Program)

Thomas L. Credelle Curriculum Vitae

Professional Experience

- From: 2008
To: Present
Organization: **TLC Display Consulting**
Title: President
Summary:
- Technical consulting in the field of flat panel displays, LEDs, and display electronics
 - Business/patent consulting in the fields of displays, LEDs, optics, new technology
- From: 2016
To: 2018
Organization: **RealD**
Title: Acting CEO, RealD Me (2016-2017), Strategic Advisor, RealD 2017-2019)
Summary:
- Business and technical advisor to RealD Intelligent Backlight Business Unit
- From: 2012
To: 2016
Organization: **Innova Dynamics, Inc.**, San Francisco, CA
Title: VP, Application Engineering and Device Performance
Summary:
- Primary interface between customer and product engineering
 - Testing and qualification of all products
 - Business development/technical contact for new opportunities
- From: 2008
To: 2018
Organization: **Display Engineering, Inc.** San Jose, CA
Title: Contractor
Summary:
- Design and testing of high-brightness LED backlights for outdoor signage
 - Circuit design and thermal analysis of LED light bars
 - Developed new methods for passive cooling of LED light sources

Thomas L. Credelle Curriculum Vitae

From: 2007
To: 2008
Organization: **Puredepth, Inc.**, Redwood City, CA and Auckland, NZ
Title: Senior VP Engineering
Summary:

- Recruited to establish first senior management leadership position for hardware and software engineering related to Puredepth's Multi Layer Display (MLD) technology.
- Rapidly learned details of technology, established new development plans, and supported customer engagements in US, Korea, and Japan.
- Divided time between US and NZ offices, supporting sales/marketing and leading engineering effort.

From: 2001
To: 2007
Organization: **Clairvoyante, Inc.**, Cupertino, CA
Title: VP Engineering
Summary:

- Responsible for engineering, product development, product roadmap, marketing of technology that improves resolution and reduces power of color flat panel displays.
- Responsible for applied R&D, IC development, customer training and support for all technology integration programs.
- Creation of new intellectual property to advance adoption of Clairvoyante technology.
- Monthly interaction with leading LCD producers in Taiwan, Korea, Japan; management of all vendors relating to product development (8-10 on-site visits per year).

From: 1999
To: 2001
Organization: **Alien Technology Corporation**, Morgan Hill, CA
Title: VP of Operations
Summary:

- Key member of management team to develop novel technology for nanoblock-IC assembly using fluidic process. Responsible for facilities, manufacturing operations, IT, and HR; managed \$20M construction project for mfg.
- Key contributor to display-related use of Alien manufacturing processes.
- Contributed to patent portfolio for Alien with key inventions in Nanoblock™ IC manufacturing techniques for displays and RFID tags.

Thomas L. Credelle Curriculum Vitae

From: 1996
To: 1999
Organization: **Motorola**, Flat Panel Display Division, Tempe, AZ
Title: Director, Product Marketing
Summary:

- Responsible for establishing market direction and initial sales approach for new Field Emission Displays (FED) under development within the Division.
- Won potential business for initial small FEDs in industrial and automotive applications.
- Established and managed marketing communications department, creating new brand image for product as well as managing all trade show activities.
- Contributed to product development and spec generation. Generated patent disclosures aimed at solving customer-related issues.

From: 1994
To: 1996
Organization: **Allied Signal**, Los Gatos, CA
Title: Director, Advanced Product Marketing
Summary:

- Responsible for establishing product marketing direction and establishing customer contacts for newly-developed optical films for viewing angle enhancement for LCDs.
- Participated in product development, product improvement based on customer input.

From: 1991
To: 1994
Organization: **Apple Computer**, Cupertino, CA.
Title: Manager, Display Engineering
Summary:

- Responsible for all LCD engineering and qualification for first PowerBook notebook computers introduced to market.
- Extensive interaction with Asian suppliers.
- Generated patent disclosures related to LCD integration in notebook PCs

Thomas L. Credelle Curriculum Vitae

From: 1986
To: 1991
Organization: **GE** R&D Center, Schenectady, NY
Title: Manager, TFT LCD Research and Development
Summary:

- Managed R&D in TFT and LCD technology for avionics applications. Led the team that built the first 1 million pixel color LCD. Led development of various optical devices based on liquid crystal materials.
- Established photonics effort based on liquid crystal technology.

From: 1970
To: 1986
Organization: **RCA** Sarnoff Labs, Princeton, NJ
Title: Individual Contributor, then Group Manager
Summary:

- Increasing levels of responsibility in the R&D of optical materials and flat panel displays.
- Key contributor to novel methods for large screen flat panel TFT.
- Established TFT LCD Program at Sarnoff Labs in 1983.
- Led development of first polySi TFT LCDs at Sarnoff Labs.

Legal Consulting

Expert Engagement:

Type of Matter: Deposition on patent dispute
Client: Alien Technology
Case Name: Alien v. Avery, Case No. 08-cv-00795
Services Provided: Deposed as expert and inventor on behalf of Alien
Date: October 29, 2008

Expert Engagement:

Type of Matter: Patent Infringement, LCD Projection
Client: McKenna Long & Aldridge LLP
Case Name: Undisclosed
Services Provided: Non-testifying expert on ITC case
Date: November 2011

Thomas L. Credelle Curriculum Vitae

Expert Engagement:

Type of Matter: LCD backlight
Client: Steptoe and Johnson LLP on behalf of LG
Case Name: In the Matter of Certain Devices for Improving Uniformity Used in a Backlight Module and Products Containing the Same Inv. No. 337-TA-805
Services Provided: Non-testifying expert on ITC case (settled)
Date: November 2011

Expert Engagement:

Type of Matter: Display driving method for eBooks
Client: Klarquist Sparkman LLP on behalf of Amazon (v. Positive Technologies)
Case Name: 2:11-cv-2226, N.D. Calif.
Services Provided: Expert Reports, Testifying Expert (settled)
Date: October 2012 – April 2013

Expert Engagement:

Type of Matter: Display driving method for eBooks
Client: Alston and Bird LLP on behalf of Barnes and Noble (v. Positive Technologies)
Case Name: 3:11-cv-02226-SI
Services Provided: Testifying expert on District Court Case (settled) Non infringement and non-enablement reports written.
Date: March 2013 – July 2013

Expert Engagement:

Type of Matter: LCD driving method
Client: Kenyon and Kenyon LLP on behalf of Sony (v. Surpass)
Case Name: IPR2015-0863
Services Provided: IPR Reports and Deposition
Date: Jan 2015-Mar 2016

Expert Engagement:

Type of Matter: LCD Optics and TFT design
Client: Marc Labgold on behalf of Funai (v. Gold Charm Ltd.)
Case Name: IPR2015-01448
Services Provided: IPR Report
Date: Apr, 2015 – Jul, 2015

Expert Engagement:

Type of Matter: LCD Backlights using LEDs
Client: Shearman & Sterling LLP/Fried Frank LLP on behalf of Mercedes Benz (v. Innovative Display Technologies)
Case Name: IPR2015-01995, IPR2015-01115, IPR2015-01113 and 2: 14-cv-00535 TXEDC
Services Provided: IPR Expert Reports
Date: Mar 2015 – May 2015

Thomas L. Credelle Curriculum Vitae

Expert Engagement:

Type of Matter: TFT array and LCD panel interconnect
Client: Covington & Burling on behalf of Samsung Display Co. (v. MiiC & Partners)
Case Name: IPR205-01469, IPR2015-01499
Services provided: IPR Expert Reports
Date: May 2015- Mar 2016

Expert Engagement:

Type of Matter: LCD Backlights using LEDs
Client: Mayer Brown on behalf of KJ Pretech (v. Innovative Display Technologies)
Case Name: IPR2015-01866, IPR2015-01867, IPR2015-01868
Services Provided: IPR reports and depositions (3)
Date: Aug 2015-Jun 2016

Expert Engagement:

Type of Matter: LCD backlights using LEDs
Client: Gibson, Dunn, and Crutcher LLP on behalf of Vizio (v. Delaware Display Group LLC)
Case Name: Case No. 13-cv-2112
Services Provided: Non-infringement Report, Deposition, Testifying Expert (settled)
Date: Sep 2015-Mar 2017

Expert Engagement:

Type of Matter: LCD manufacturing, TFT array design
Client: Sughrue Mion PLLC on behalf of TCL
Case Name: Arbitration (Hong Kong) between AUO and TCL
Services Provided: Non-infringement analysis of TFT array design (settled)
Date: Jun 2017 – Sep 2017

Expert Engagement:

Type of Matter: LED display panels
Client: Adduci Mastriani & Schaumberg on behalf of Ultravision Technologies LLC (v. >20 Chinese companies)
Case Name: ITC Case 337-TA-1114
Services Provided: Expert Reports (Invalidity and Non-infringement) and Deposition (3 days)
Date: Jan 2018 – Feb, 2019

Expert Engagement:

Type of Matter: LCD gamma circuit
Client: K&L Gates on behalf of Wistron (v. plaintiff Phenix Longhorn)
Case Name: IPR2018-01255, 2:17 cv-00711 TXEDC
Services Provided: Expert report and Expert Testimony as needed (settled)
Date: May 2018 – Jun 2019

Thomas L. Credelle Curriculum Vitae

Expert Engagement:

Type of Matter: LED packaging
Client: Davidson, Berquist, Jackson & Gowdey, LLP on behalf of Document Security Systems (v. defendants Seoul Semiconductor, Nichia Corp, Cree, Inc., Everlight Electronics)
Case Name: IPR2018-00966, 2018-01165
Services Provided: Expert Reports, Depositions (2) and Expert Testimony at trial as needed
Date: June 2018 – May 2019

Expert Engagement:

Type of Matter: TFT-LCD technology
Client: Vinson and Elkins on behalf of AUO (v. plaintiff Vista Park Ventures)
Case Name: 2:18 cv-00276, 00278, 00279 TXEDC
Services Provided: Expert reports and Expert Testimony as needed (settled)
Date: Dec 2018 – Sep 2019

Expert Engagement:

Type of Matter: LED Display Panels
Client: Fabricant LLP on behalf of Plaintiff Ultravision (v. >10 companies)
Case Name: 2:18 cv-00112, 00118, 00150 TXEDC
Services Provided: Expert report and Expert Testimony as needed; two days deposition in 2020, two depositions in 2021. **Testified at trial May 2021**
Date: Jan 2019 – Present

Expert Engagement:

Type of Matter: TFT-LCD technology
Client: McDermott, Will and Emery on behalf of TCL (v. plaintiff Vista Park Ventures)
Case Name: 2:19 cv-00188, 00189, 00190, 00191 TXEDC
Services Provided: Expert reports and Expert Testimony as needed (settled)
Date: Aug 2019 – Oct 2019

Expert Engagement:

Type of Matter: TFT-LCD technology
Client: McDermott, Will and Emery on behalf of GiantPlus (v. plaintiff Vista Park Ventures)
Case Name: 2:19 cv-00183, 00184, 00185, 00187 TXEDC
Services Provided: Expert reports and Expert Testimony as needed (settled)
Date: Oct 2019 – Jan, 2020

Expert Engagement:

Thomas L. Credelle Curriculum Vitae

Type of Matter: TFT-LCD technology
Client: Vincent and Elkins on behalf of JDI (v. plaintiff Vista Park Ventures)
Case Name: 2:19 cv-00323, 00324, 00325 TXEDC
Services Provided: Expert reports and Expert Testimony as needed (settled)
Date: Nov 2019 – Jun 2020

Expert Engagement:

Type of Matter: TFT-LCD technology
Client: Sidley on behalf of LG Electronics (v. defendant Hisense)
Case Name: 2:19 cv-09474 CACDC
Services Provided: Expert reports and Expert Testimony as needed (settled)
Date: Feb. 2020 – Jan. 2021

Expert Engagement:

Type of Matter: Quantum dot technology
Client: Murtha Law on behalf of RPI (v. defendant Samsung)
Case Name: 2:19 cv-20097 KM-ESK
Services Provided: Expert reports and Expert Testimony as needed
Date: Jan. 2020 – Jun 2021

Expert Engagement:

Type of Matter: OLED, touch panels
Client: RAK Law on behalf of Solas (v. defendant Samsung)
Case Name: 2:19-cv-00152-JRG (E.D. Tex)
Services Provided: Expert reports and Expert Testimony; two depositions in 2020.
Testified at trial Mar. 2021.
Date: Apr. 2020 – Mar. 2021

Expert Engagement:

Type of Matter: LCD technology
Client: Morgan Lewis on behalf of Fuji Film (v. plaintiff Vista Park Ventures)
Case Name: 2:20 cv-00064, 65, 66 E.D. Tex.
Services Provided: Expert reports and Expert Testimony as needed (settled)
Date: Jul. 2020 – Oct 2020

Expert Engagement:

Type of Matter: Touch panels
Client: DLA Piper, Alston and Bird, on behalf of Microsoft, Dell (v. plaintiff Neodron)
Case Name: 2:19-cv-00318-ADA (W.D. Tex)
Services Provided: Expert Reports and Expert Testimony as needed (settled)
Date: Aug. 2020 – Nov. 2020

Thomas L. Credelle Curriculum Vitae

Expert Engagement:

Type of Matter: LCD
Client: Vincent and Elkins on behalf of Japan Display Inc (v. defendant Tianma)
Case Name: 2:20-CV-00283, 284, 285-JRG (E.D. Tex)
Services Provided: Expert Reports, depositions, and Expert Testimony as needed (settled)
Date: Jan 2021 – Jan 2022

Expert Engagement:

Type of Matter: LCD
Client: Perkins Coie on behalf of Truly Semiconductor, Hannstar (v. plaintiff Vista Park Ventures)
Case Name: 2:20-CV-250, 251, 252 (E.D. Tex)
Services Provided: Expert Reports and Expert Testimony as needed (settled)
Date: Jan 2021 – June 2021

Expert Engagement:

Type of Matter: Quantum dots
Client: Mintz on behalf of Nanoco (v. defendant Samsung)
Case Name: 2:20-CV-00038-JRG (E.D. Tex)
Services Provided: Expert Reports, depositions, case settled day before trial opening arguments
Date: Jan 2021 – Jan 2023

Expert Engagement:

Type of Matter: OLED circuits
Client: Morrison Forster on behalf of JOLED (v. defendant Samsung)
Case Name: Case No. 6:20cv559 (W.D. Tex.)
Services Provided: Expert Reports and Expert Testimony (settled)
Date: July 2020 – April 2021

Expert Engagement:

Type of Matter: OLED circuits
Client: Perkins Coie on behalf of AUO (v. defendant Samsung)
Case Name: TBD
Services Provided: Expert Reports and Testimony (settled)
Date: Feb. 2021 – May 2021

Expert Engagement:

Type of Matter: LED circuits
Client: Kim IP on behalf of CAST Lighting (v. Plaintiff WAC Lighting)
Case Name: ITC Inv. No. 337-TA-1261
Services Provided: Expert Reports and Testimony (settled)
Date: May 2021 – Oct 2021

Thomas L. Credelle Curriculum Vitae

Expert Engagement:

Type of Matter: OLED circuits
Client: RAKLaw on behalf of Solas, Ltd. (v. Defendant Samsung)
Case Name: ITC Inv. No. 337-TA-1243
Services Provided: Expert Reports and **Testified at Hearing Nov. 15-19, 2021**
Date: May 2021 – Dec 2021

Expert Engagement:

Type of Matter: OLED circuits
Client: PV Law on behalf of TCL (vs. Plaintiff SEL Co.)
Case Name: 8:21-cv-00554-JAK-ADS (CDCA)
Services Provided: Expert Reports and Depositions; case settled
Date: July 2021 – July 2023

Expert Engagement:

Type of Matter: LED circuits
Client: Carmichael IP on behalf of Lynk Labs (vs. defendant Samsung)
Case Name: IPR Proceedings
Services Provided: Expert Reports and Depositions
Date: Jan 2022 – Jan 2023

Expert Engagement:

Type of Matter: OLED circuits
Client: Baker Botts on behalf of FujiFilm (vs. defendant ButterflyQ)
Case Name: C.A. No. 22-309-JPM
Services Provided: Expert Reports and Depositions, testify at trial if needed (settled Nov, 2023)
Date: Jul 2022 – Nov. 2023

Expert Engagement:

Type of Matter: Outdoor signage
Client: Kilpatrick Townsend on behalf of MRI, Inc. (vs. defendants Samsung et al)
Case Name: ITC 337-TA-1331
Services Provided: Expert Reports, Depositions, **Testified at Hearing June 26-30, 2023**
Date: Oct 2022 - present

Expert Engagement:

Type of Matter: OLED circuits and pixel arrangements
Client: Orrick Herrington & Sutcliffe LLP on behalf of BOE (vs. plaintiff Samsung et al)
Case Name: ITC 337-TA-1351
Services Provided: Expert Reports, Depositions, testify at Hearing as needed
Date: Sep 2023 - present

Thomas L. Credelle Curriculum Vitae

Expert Engagement:

Type of Matter: Light concentrators, LCD backlights
Client: Katz PLLC on behalf of SVV (vs. defendants Asus and Acer)
Case Name: WD Tex 6:22-cv-0311, 312, 313, 511, 512, 513, 639, 640, 641-ADA
Services Provided: Expert Reports, Depositions, testify at trial if needed
Date: Jan 2023- present

Expert Engagement:

Type of Matter: LCD AMOLED circuits,
Client: Kramer Alberti on behalf of Polaris PowerLED Technologies, LLC (vs. defendant Samsung et al)
Case Name: EDTEX 2:22-cv-00469-JRG
Services Provided: Expert Reports (IPR and DC), Depositions, testifying expert
Date: Mar 2023- present

Expert Engagement:

Type of Matter: LCD AMOLED circuits,
Client: Morrison & Forester LLP on behalf of Crystal Leap (vs. defendant HKC)
Case Name: No. 2:22-cv-00382 (EDTEX)
Services Provided: Expert Reports (IPR and DC), Depositions, testifying expert
Date: Jul 2023- present

Expert Engagement:

Type of Matter: LCD AMOLED circuits,
Client: Kramer Alberti on behalf of Polaris PowerLED Technologies, LLC (vs. defendant Vizio et al)
Case Name: 2:23-cv-03478-GW-PD (CD CAL)
Services Provided: Expert Reports (IPR and DC), Depositions, testifying expert
Date: Dec 2023- present

Thomas L. Credelle Curriculum Vitae

Consulting Projects

Consulting Engagement:

Client: Tessera
Services Provided: Business case analysis for M&A department
Date: Mar 2008 to 2011

Consulting Engagement:

Client: Sipix Imaging
Services Provided: Technical consulting on display algorithms
Date: Mar 2008 to 2009

Consulting Engagement:

Client: Holox Technologies, Inc. (self-funded start up in holographic optics)
Services Provided: CEO; business leadership, fund raising, market analysis, optical design of advanced diffusers for LCD backlights, solar collectors, window films.
Date: Sept 2008 to June 2012

Consulting Engagement:

Client: Innova Dynamics, Inc.
Services Provided: Technical and business development consulting in touch screen technology
Date: October 2011 to November 2012

Technical and Patent Consulting:

Client: LG Display
Services Provided: Technical consulting on pixel processing algorithms, OLED displays; patent generation for advanced pixel concepts for OLED.
Date: Aug 2009 to Dec 2011

Consulting Engagement:

Client: Scivax
Services Provided: Technical and business development consulting in nanoimprinting technology
Date: Feb 2018 to Jul 2018

Thomas L. Credelle Curriculum Vitae

Professional Affiliations, Achievements & Awards

- Fellow of the Society for Information Display (SID)
- Past Director, SID Symposium Committee (10 years)
- Conference and Program Chair, SID Symposium and IDRC
- Past Member, SID Program Committee (15 years)

US Patents & Publications

<u>Patent</u>	<u>Date</u>	<u>Description</u>
10,163,985	12/25/2018	Subpixel arrangement structure for a display device
9,583,034	02/28/2017	Subpixel arrangement structure for a display device
9,041,625	05/26/2015	Subpixel arrangement structure for a display device and display device
9,001,167	04/07/2015	Display panel having crossover connections effecting dot inversion
8,933,959	01/13/2015	Subpixel layouts and subpixel rendering methods for directional displays and systems
8,876,937	11/04/2014	Production of nanostructures
8,797,344	08/05/2015	Memory structures for image processing
8,754,913	06/17/2014	Subpixel arrangement structure of display device
8,704,744	04/22/2014	Systems and methods for temporal subpixel rendering of image data
8,633,886	01/21/2014	Display panel having crossover connections effecting dot inversion
8,519,910	08/27/2013	Image processing method and display device using the same
8,516,683	08/27/2013	Methods of making a radio frequency identification (RFID) tags
8,456,496	06/04/2013	Color flat panel display sub-pixel arrangements and layouts for sub-pixel rendering with split blue sub-pixels
8,456,414	06/04/2013	Gamma adjustment with error diffusion for electrophoretic displays
8,436,799	05/07/2013	Image degradation correction in novel liquid crystal displays with split blue subpixels
8,421,820	04/16/2013	Methods and systems for sub-pixel rendering with adaptive filtering
8,411,022	04/02/2013	Multiprimary color display with dynamic gamut mapping
8,405,692	03/26/2013	Color flat panel display arrangements and layouts with reduced blue luminance well visibility
8,378,947	02/19/2013	Systems and methods for temporal subpixel rendering of image data
8,294,741	10/23/2012	Four color arrangements of emitters for subpixel rendering
8,259,127	09/04/2012	Systems and methods for reducing desaturation of images rendered on high brightness displays
8,144,094	03/27/2012	Liquid crystal display backplane layouts and addressing for non-standard subpixel arrangements

Thomas L. Credelle Curriculum Vitae

8,134,583	03/13/2012	Two color flat panel display sub-pixel arrangements and layouts for sub-pixel rendering with split blue sub-pixels
8,035,599	10/11/2011	Display panel having crossover connections effecting dot inversion
8,018,476	09/13/2011	Subpixel layouts for high brightness displays and systems
8,013,867	09/06/2011	Systems and methods for implementing improved gamut mapping algorithms
7,969,456	06/28/2011	Methods and systems for sub-pixel rendering with adaptive filtering
7,876,341	06/25/2011	Subpixel layouts for high brightness displays and systems
7,864,194	01/04/2011	Systems and methods for motion adaptive filtering
7,791,679	09/07/2010	Alternative thin film transistors for liquid crystal displays
7,755,652	07/13/2010	Color flat panel display sub-pixel rendering and driver configuration for sub-pixel arrangements with split sub-pixels
7,701,476	04/20/2010	Four color arrangements of emitters for subpixel rendering
7,646,430	01/12/2010	Display system having improved multiple modes for displaying image data from multiple input source formats
7,592,996	09/22/2009	Multiprimary color display with dynamic gamut mapping
7,583,279	09/01/2009	Subpixel layouts and arrangements for high brightness displays
7,573,493	08/11/2009	Four color arrangements of emitters for subpixel rendering
7,573,448	08/11/2009	Dot inversion on novel display panel layouts with extra drivers
7,559,131	07/14/2009	Method of making a radio frequency identification (RFID) tag
7,505,053	03/17/2009	Subpixel layouts and arrangements for high brightness displays
7,492,379	02/17/2009	Color flat panel display sub-pixel arrangements and layouts for sub-pixel rendering with increased modulation transfer function response
7,417,648	08/26/2008	Color flat panel display sub-pixel arrangements and layouts for sub-pixel rendering with split blue sub-pixels
7,397,455	07/08/2008	Liquid crystal display backplane layouts and addressing for non-standard subpixel arrangements
7,283,142	10/16/2007	Color display having horizontal sub-pixel arrangements and layouts
7,260,882	08/28/2007	Methods for making electronic devices with small functional elements supported on a carriers
7,248,271	07/24/2007	Sub-pixel rendering system and method for improved display viewing angles
7,218,301	05/15/2007	System and method of performing dot inversion with standard drivers and backplane on novel display panel layouts
7,187,353	03/06/2007	Dot inversion on novel display panel layouts with extra drivers
7,184,066	02/27/2007	Methods and systems for sub-pixel rendering with adaptive filtering
7,167,186	01/23/2007	Systems and methods for motion adaptive filtering
7,084,923	08/01/2006	Display system having improved multiple modes for displaying image data from multiple input source formats
7,068,287	06/27/2006	Systems and methods of subpixel rendering implemented on display panels
7,046,256	05/16/2006	System and methods of subpixel rendering implemented on display panels
6,985,361	01/10/2006	Electronic devices with small functional elements supported on a carrier
6,917,368	07/12/2005	Sub-pixel rendering system and method for improved display viewing angles

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6,816,380	11/09/2004	Electronic devices with small functional elements supported on a carrier
6,731,353	05/04/2004	Method and apparatus for transferring blocks
6,693,384	02/17/2004	Interconnect structure for electronic devices
6,606,247	08/12/2003	Multi-feature-size electronic structures
5,961,362	10/05/1999	Method for in situ cleaning of electron emitters in a field emission device
5,883,467	03/16/1999	Field emission device having means for in situ feeding of hydrogen
5,477,350	12/19/1995	Interferometric spatial switch for polarized or unpolarized light using liquid crystal
5,373,393	12/13/1994	Optical interferometric device with spatial light modulators for switching substantially coherent light
5,363,228	11/08/1994	Optical device with spatial light modulators for switching arbitrarily polarized light
5,345,321	09/06/1994	Compact polarization dependent optical switching units
5,319,477	06/07/1994	Compact polarization independent optical switching units
5,317,445	05/31/1994	Optical device with spatial light modulators for switching polarized light
4,630,893	12/23/1986	LCD pixel incorporating segmented back-to-back diode
4,598,227	07/01/1986	Electron beam convergence and scanning structures for flat panel display device
4,517,489	05/14/1985	Modulator structure and method for flat panel display devices
4,484,103	11/20/1984	Color selection electron beam guide assembly for flat panel display devices
4,362,966	12/07/1982	Electron leakage reduction in flat panel display devices
4,335,332	06/15/1982	Focus mesh structure and biasing technique for flat panel display devices
4,316,118	02/16/1982	Guided beam display device
4,298,819	11/03/1981	Beam Clean up structure for flat panel display devices
4,234,815	11/18/1980	Flat display tube having shielding member between beam guide and screen
4,174,881	11/20/1979	Recording a synthetic focused-image hologram on a thermally deformable plastic
4,153,856	05/08/1979	Proximity focused element scale image display device
4,148,636	04/10/1979	Broadening the spatial frequency pass band of a thermoplastic layer
4,137,478	01/30/1979	Color flat panel television
4,137,077	01/30/1979	Broadening the spatial frequency pass band of a thermoplastic layer
4,131,823	12/26/1978	Modular flat display device with beam convergence
4,121,137	10/17/1978	System for achieving image uniformity in display devices
4,103,205	07/25/1978	Flat display device with beam guide
4,103,204	07/25/1978	Flat display device with beam guide
4,088,920	05/09/1978	Flat display device with beam guide

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Publications

1. "Thermoplastic Media for Holographic Recording," RCA Review: A Technical Journal (1972)
2. "Guided Beam Displays for Large Screen Flat-Panel Color TV," Information Display (1983)
3. "Recent trends in color avionic LCDs," Information Display (1987)
4. "Thin-film transistors for video applications," Inter. Display Research Conference Record (1988)
5. "TFT-LCD for video applications," Information Display (1989)
6. "LCDs," JTEC Panel Report on Display Technologies in Japan (1992)
7. "Viewing-Angle-Enhancement System for LCDs" SID Digest of Technical Papers (1995)
8. "SpectraVue™: A new system to enhance the viewing angle of LCDs," SID Journal (1997)
9. "The Business Case for Motorola's Flat-Panel-Display Division," Information Display (1997)
10. "MTF of high-resolution PenTile Matrix™ displays," Proc Eurodisplay (2002)
11. "Adding a White Subpixel," Information Display (2005)
12. "Low Power, High-Pixel-Density Mobile Displays Using PenTile RGBW™ Architectures," SID Mobile Displays Digest of Technical Papers (2006)
13. *"Invited Paper: High-Pixel-Density Mobile Displays: Challenges and Solutions,"* SID Digest of Technical Papers (2006)