



EXHIBIT 2018

CLAIM CHART: AMOLED DISPLAY IN SAMSUNG GALAXY S21



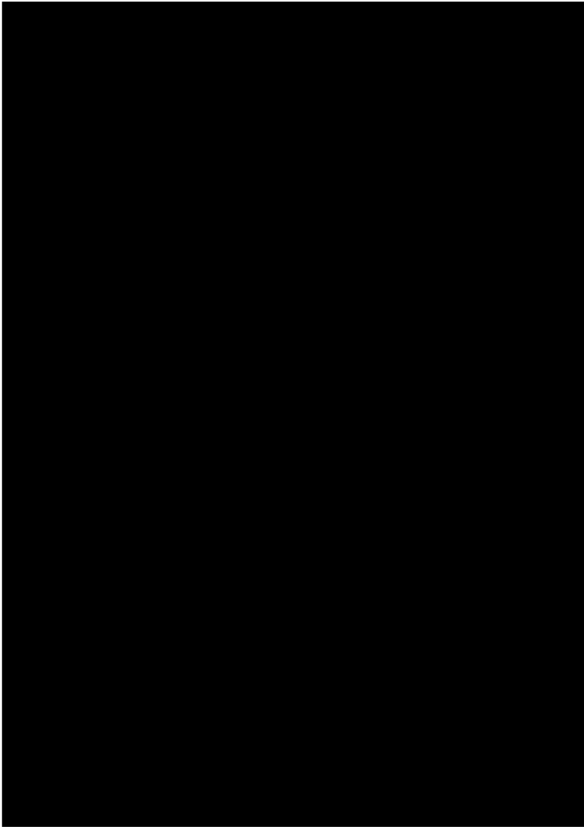
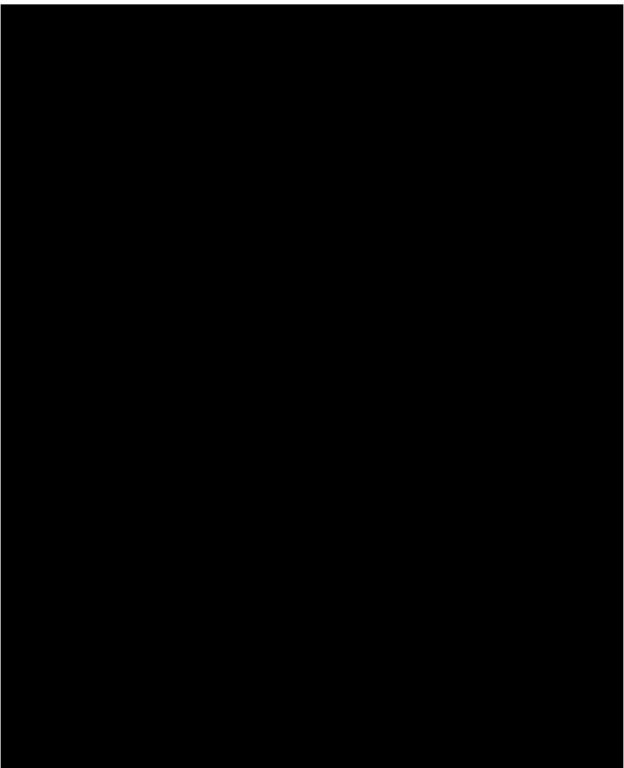
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[preamble] A pixel circuit in an organic light emitting device, comprising:	The Samsung Display AMOLED display in the Samsung Galaxy S21 Product [REDACTED] includes a pixel circuit in an organic light-emitting device. For example, [REDACTED]

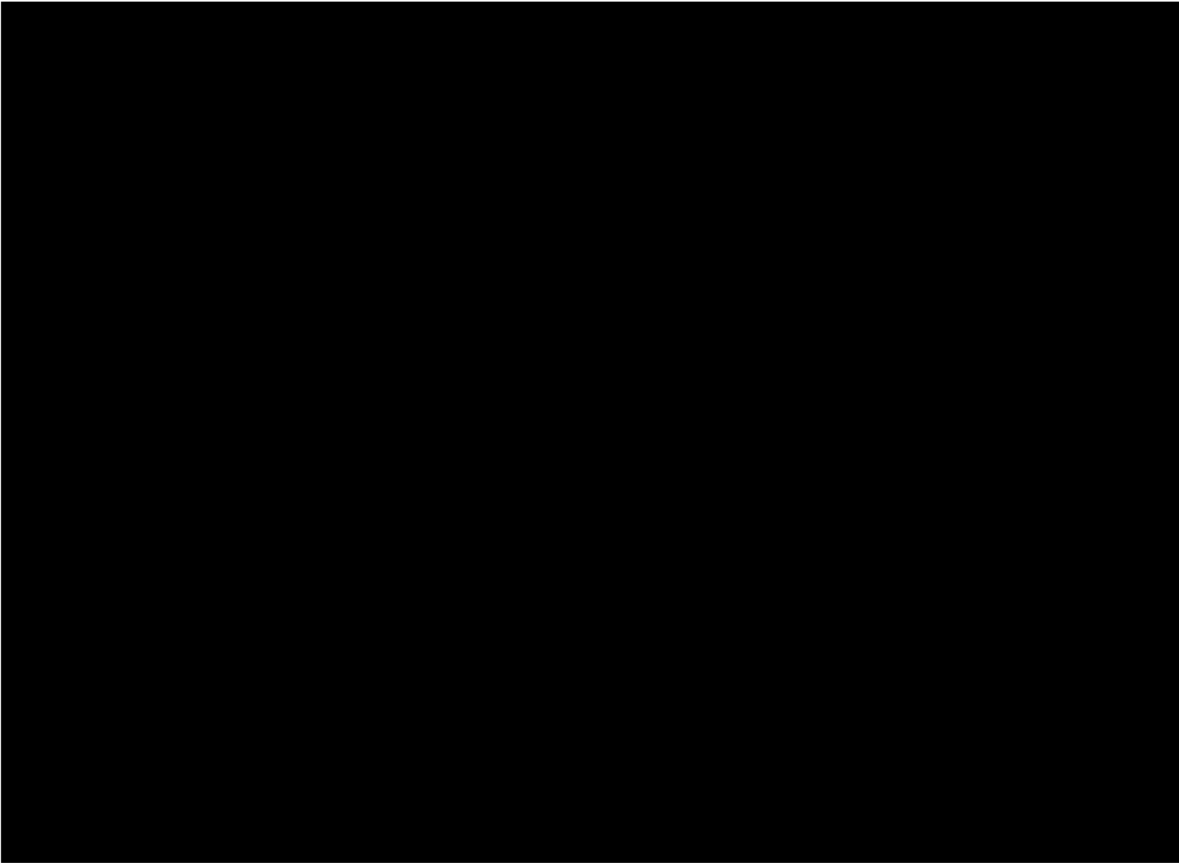


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[preamble] A pixel circuit in an organic light emitting device, comprising: <i>(cont'd)</i>	 Ex. 2020 (Galaxy S21 Teardown Photos) at 2

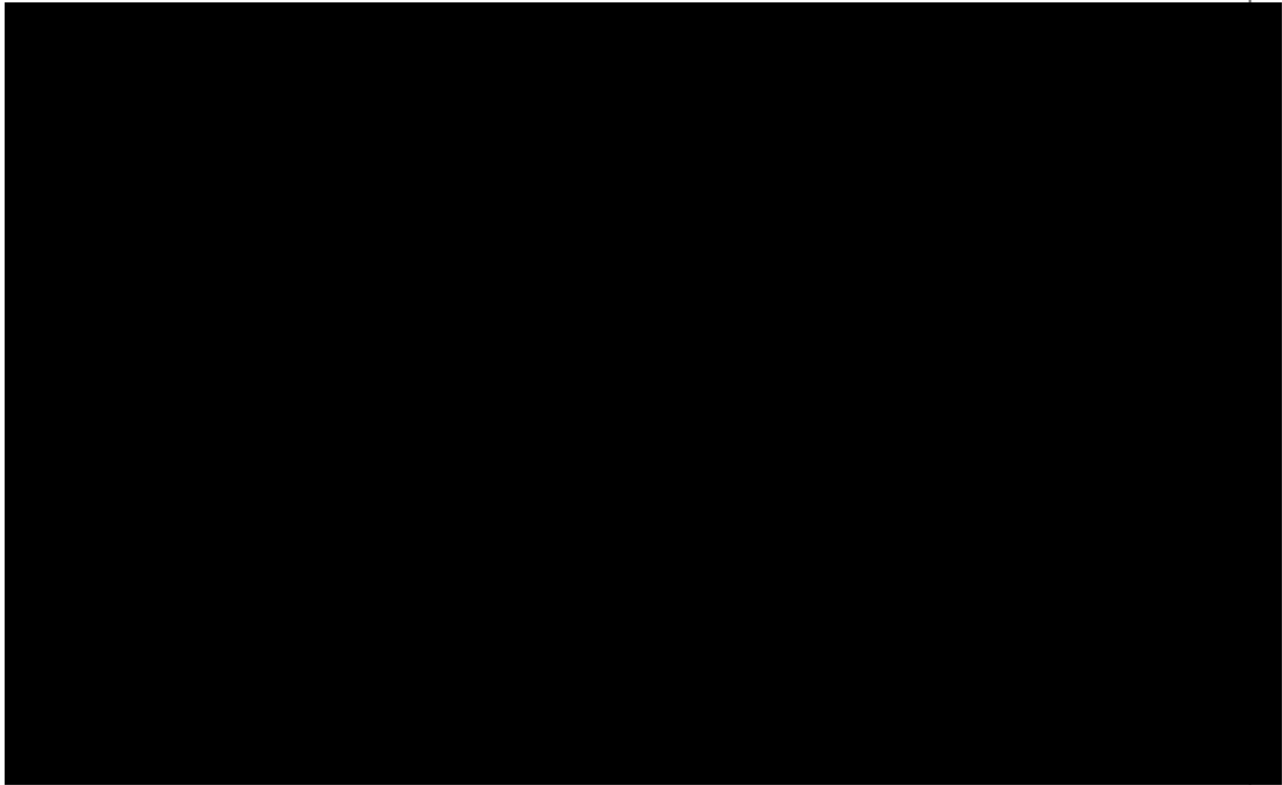
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[a] a first transistor for delivering a data signal voltage in response to a current scan line signal;	The pixel circuit of the [REDACTED] has a first transistor for delivering a data signal voltage in response to a current scan line signal. [REDACTED] the first transistor T2 is coupled to a data line [REDACTED] for delivering a data signal voltage. The gate of first transistor T2 is coupled to a scan line [REDACTED] that delivers a current scan line signal to the gate of first transistor T2. In response to the current scan line signal being active (low), first transistor T2 delivers a data signal voltage from data line [REDACTED]  

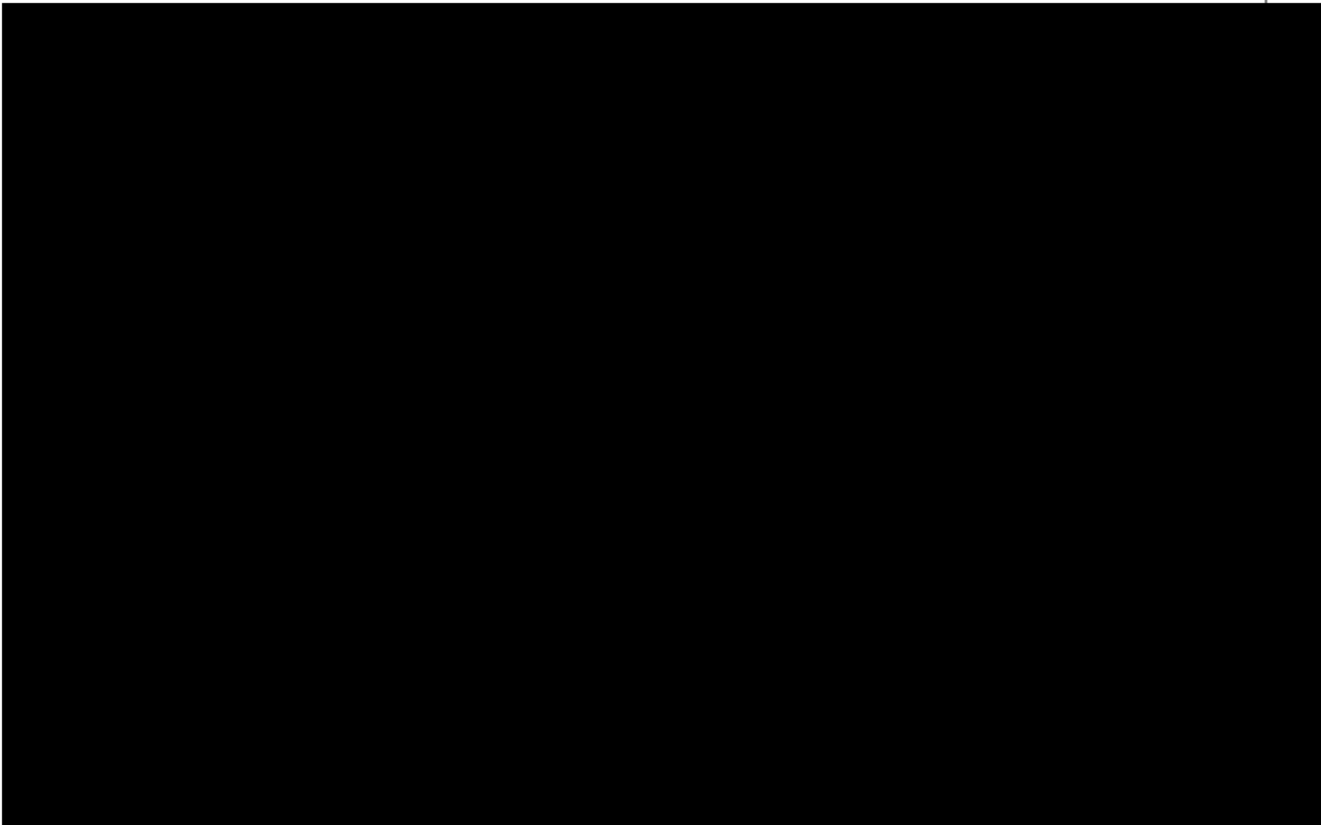
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[a] a first transistor for delivering a data signal voltage in response to a current scan line signal; (<i>cont'd</i>)	As further shown in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) present on data line [REDACTED]. The annotated [REDACTED] below depicts an exemplary voltage path from data line [REDACTED] through transistors T2-T1-T3 to the gate of transistor T1. 

[REDACTED]

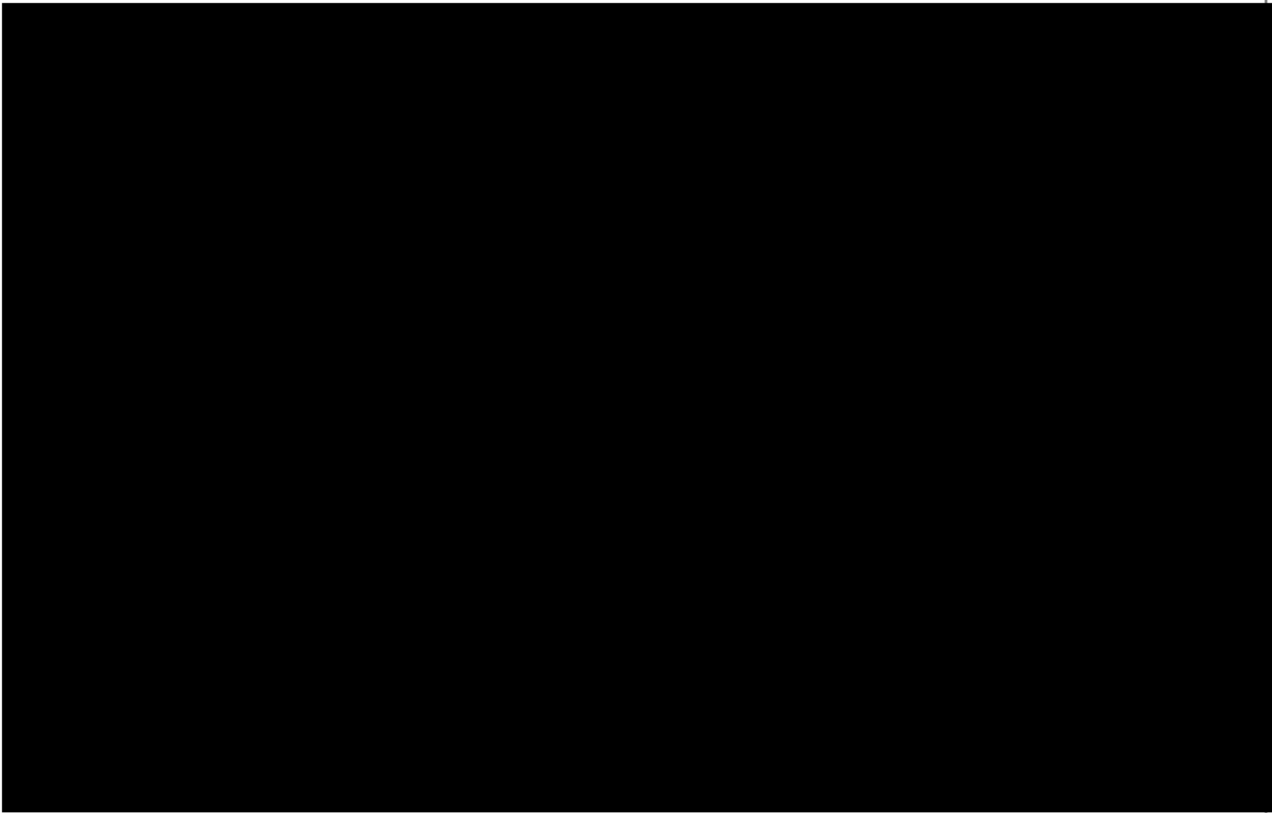
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[b] a second transistor for generating a driving current depending on the data signal voltage delivered through the first transistor;	The pixel circuit of the [REDACTED] has a second transistor for generating a driving current depending on the data signal voltage delivered through the first transistor. [REDACTED] the second transistor T1 is coupled to a power supply voltage [REDACTED] As described for claim element 1[a] above, the first transistor T2 delivers a data signal voltage in response to an active (low) current scan line signal that is delivered on scan line [REDACTED] The data signal voltage is stored on the capacitor [REDACTED] The second transistor T1 will generate a driving current dependent upon the voltage stored on the capacitor [REDACTED] and the current will be sourced from [REDACTED] 

[REDACTED]

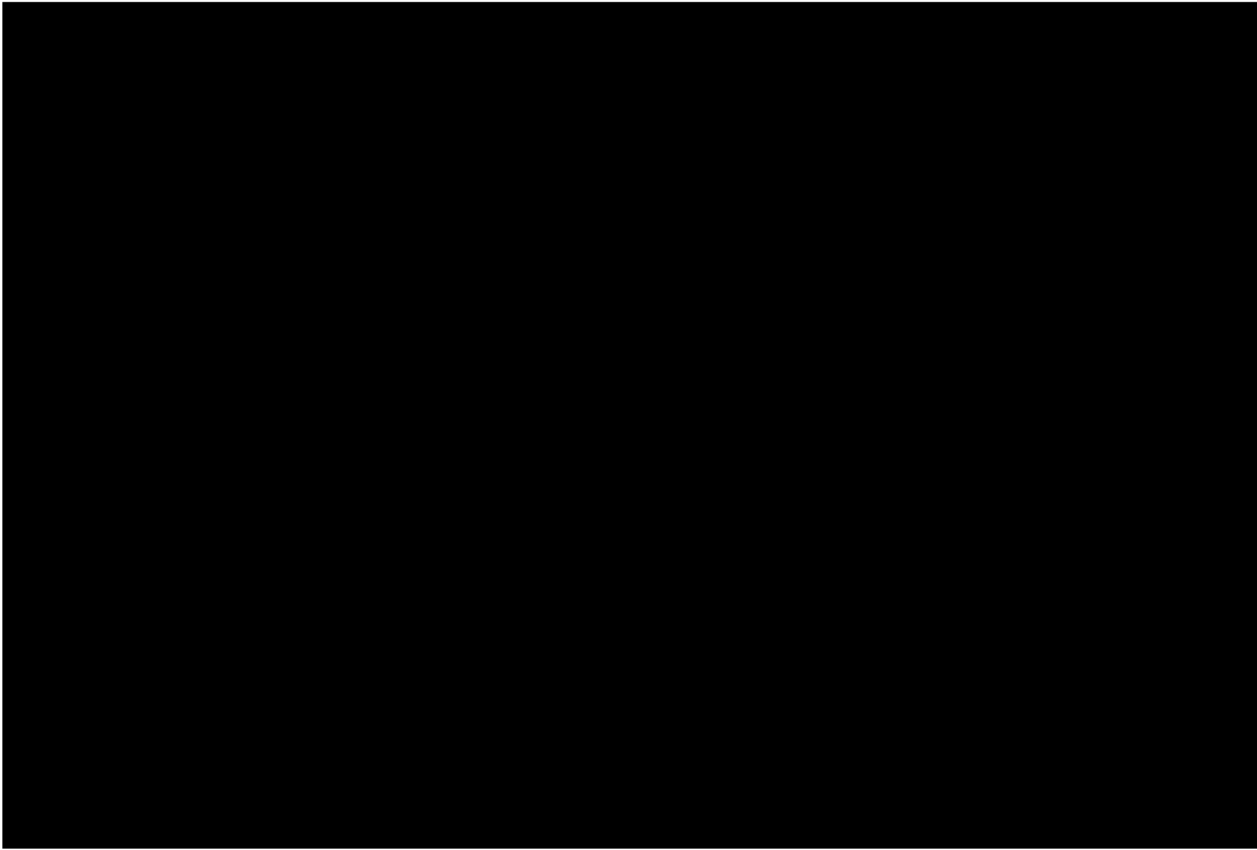
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[b] a second transistor for generating a driving current depending on the data signal voltage delivered through the first transistor; (<i>cont'd</i>)	For example, as shown in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] transistors T5 and T6 turn on, and a driving current (red line) flows from [REDACTED] through second transistor T1 to the OLED. The amount of current that flows through second transistor T1 to the OLED is dependent upon the voltage that was stored on the capacitor [REDACTED] which is based on the data signal voltage delivered previously through first transistor T2 (see claim element 1[f], below). 

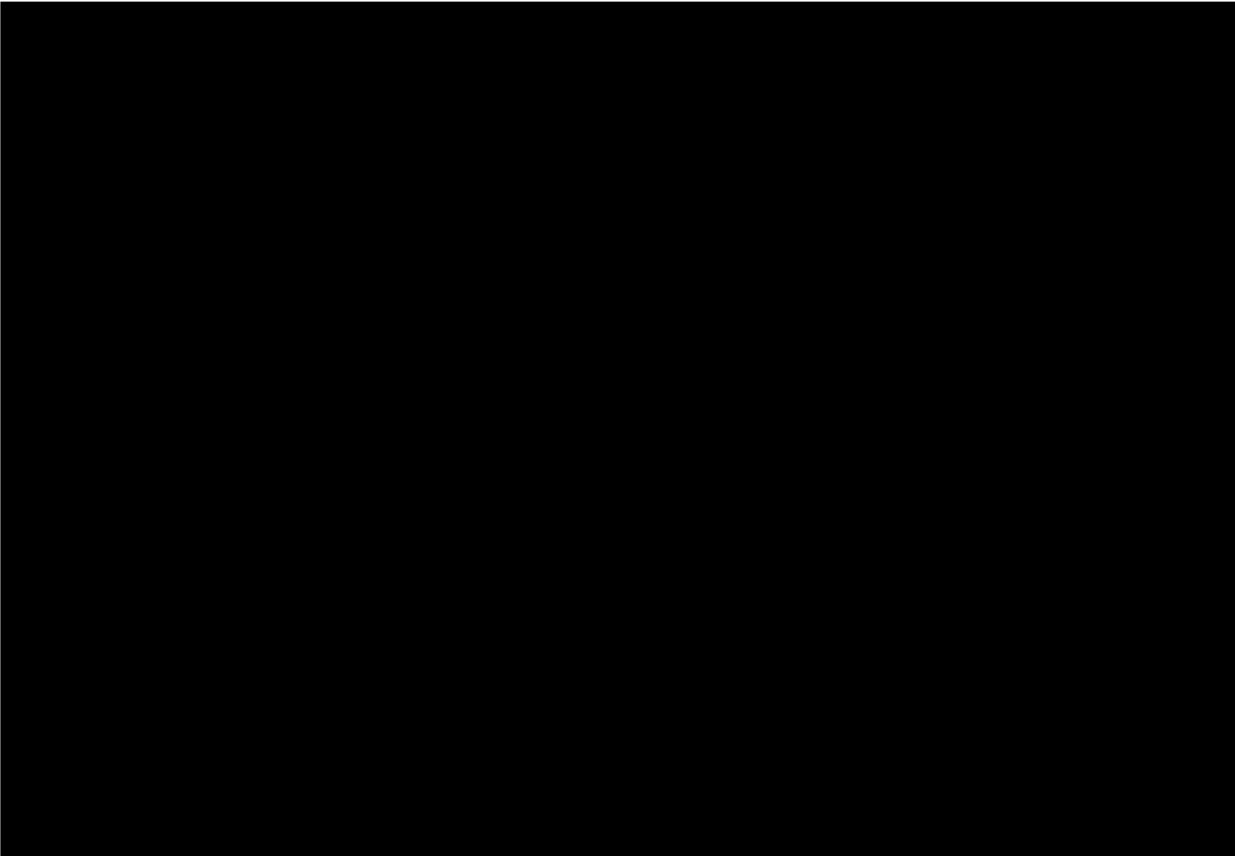
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[c] a third transistor for detecting and self-compensating threshold voltage deviation in the second transistor;	The pixel circuit of the [REDACTED] has a third transistor for detecting and self-compensating threshold voltage deviation in the second transistor. As shown in the [REDACTED] a third transistor T3 is coupled between the drain and gate of the second transistor T1 for detecting and self-compensating threshold voltage deviation in second transistor T1. Third transistor T3 is connected between the gate and the drain of second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] third transistor T3 connects the drain and gate of second transistor T1 together (red line) in the form of a diode to self-compensate a threshold voltage of second transistor T1. 

[REDACTED]

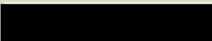
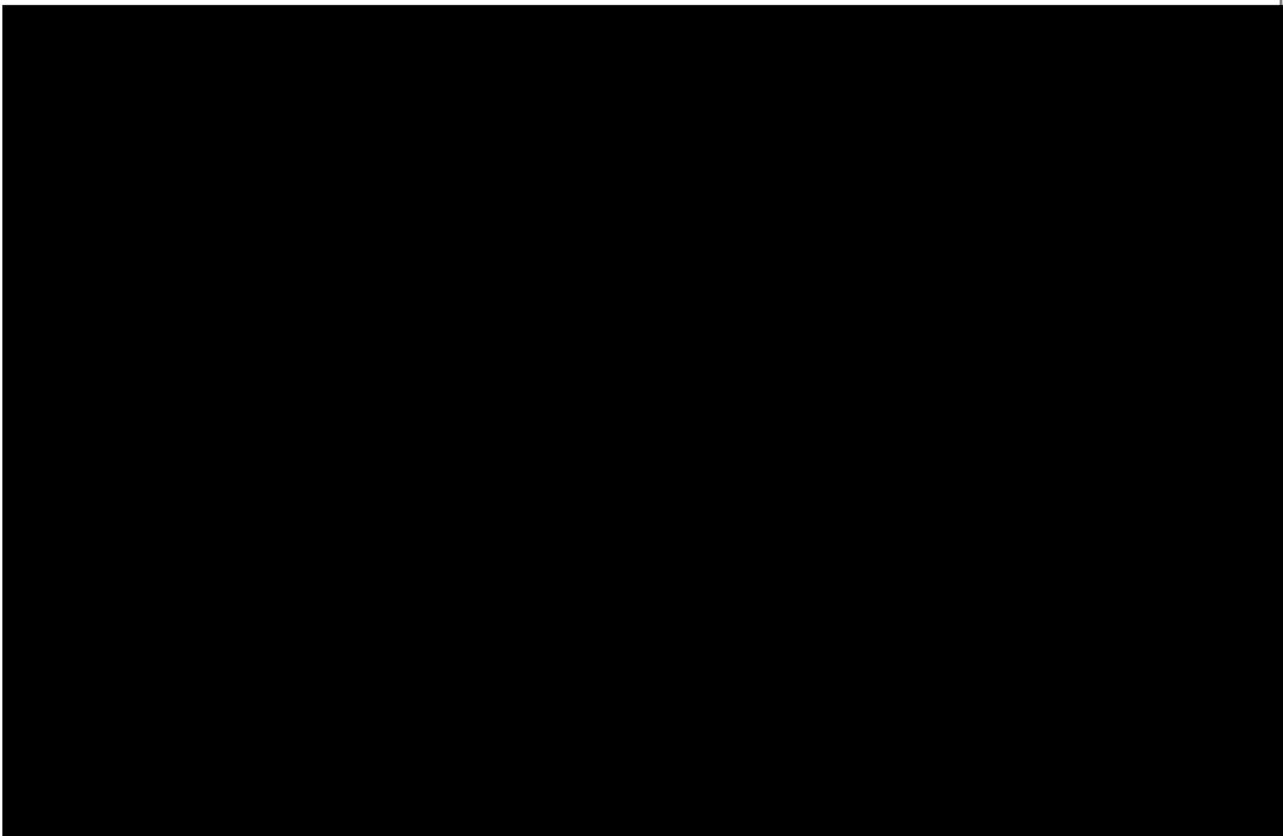
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[c] a third transistor for detecting and self-compensating threshold voltage deviation in the second transistor; (<i>cont'd</i>)	As shown in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] transistors T2 and T3 turn on and a data signal voltage (red line) on data line [REDACTED] flows through transistors T2-T1-T3 and is stored on the capacitor [REDACTED]. This arrangement allows for the detection and self-compensation of the threshold voltage deviation in second transistor T1. 

[REDACTED]

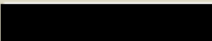
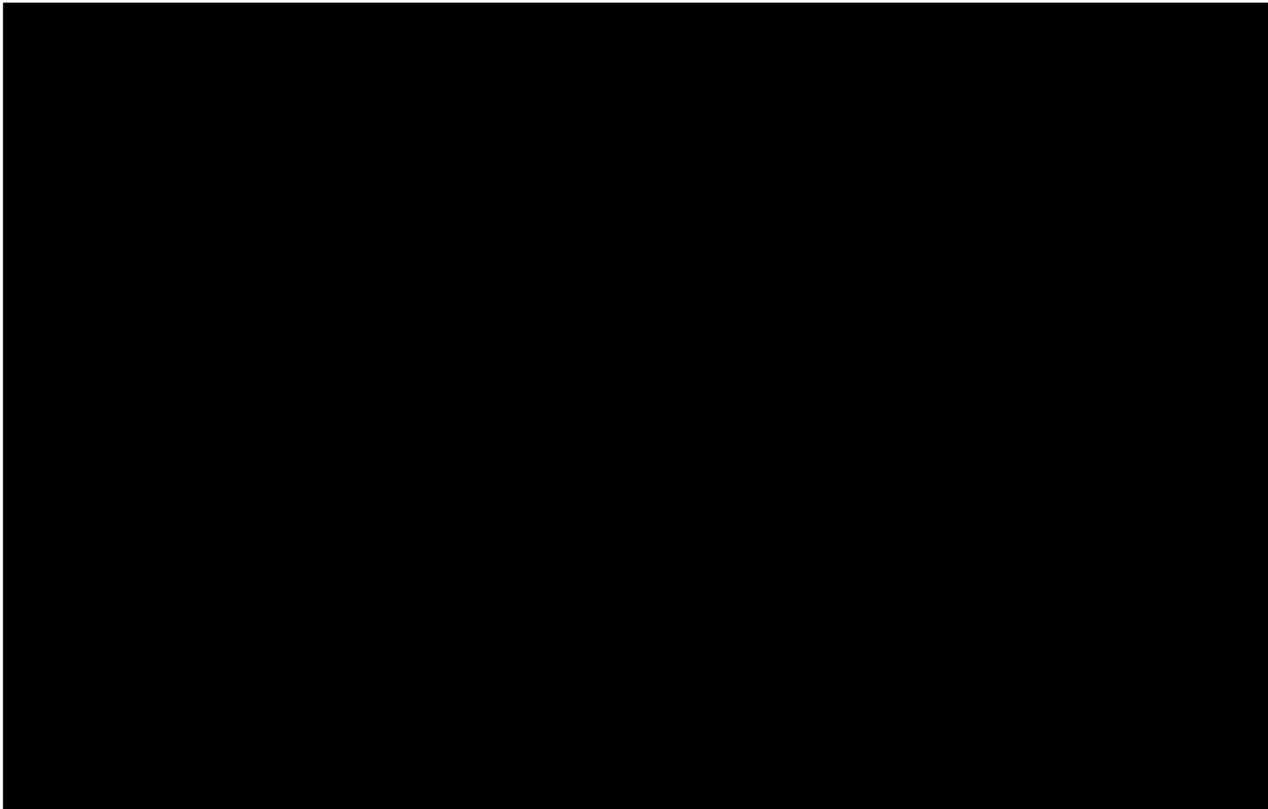
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[d] a fifth transistor for providing a power supply voltage for the second transistor in response to a current light-emitting signal;	The pixel circuit of the [REDACTED] has a fifth transistor for providing a power supply voltage for the second transistor in response to a current light-emitting signal. [REDACTED] the fifth transistor T5 is coupled to a power supply voltage [REDACTED] and second transistor T1. In response to an active (low) current light-emitting signal delivered on emission line [REDACTED] fifth transistor T5 delivers a power supply voltage from [REDACTED] to second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[d] a fifth transistor for providing a power supply voltage for the second transistor in response to a current light-emitting signal; (<i>cont'd</i>)	For example, as shown in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] fifth transistor T5 turns on and provides a power supply voltage [REDACTED] (red line) to second transistor T1. 

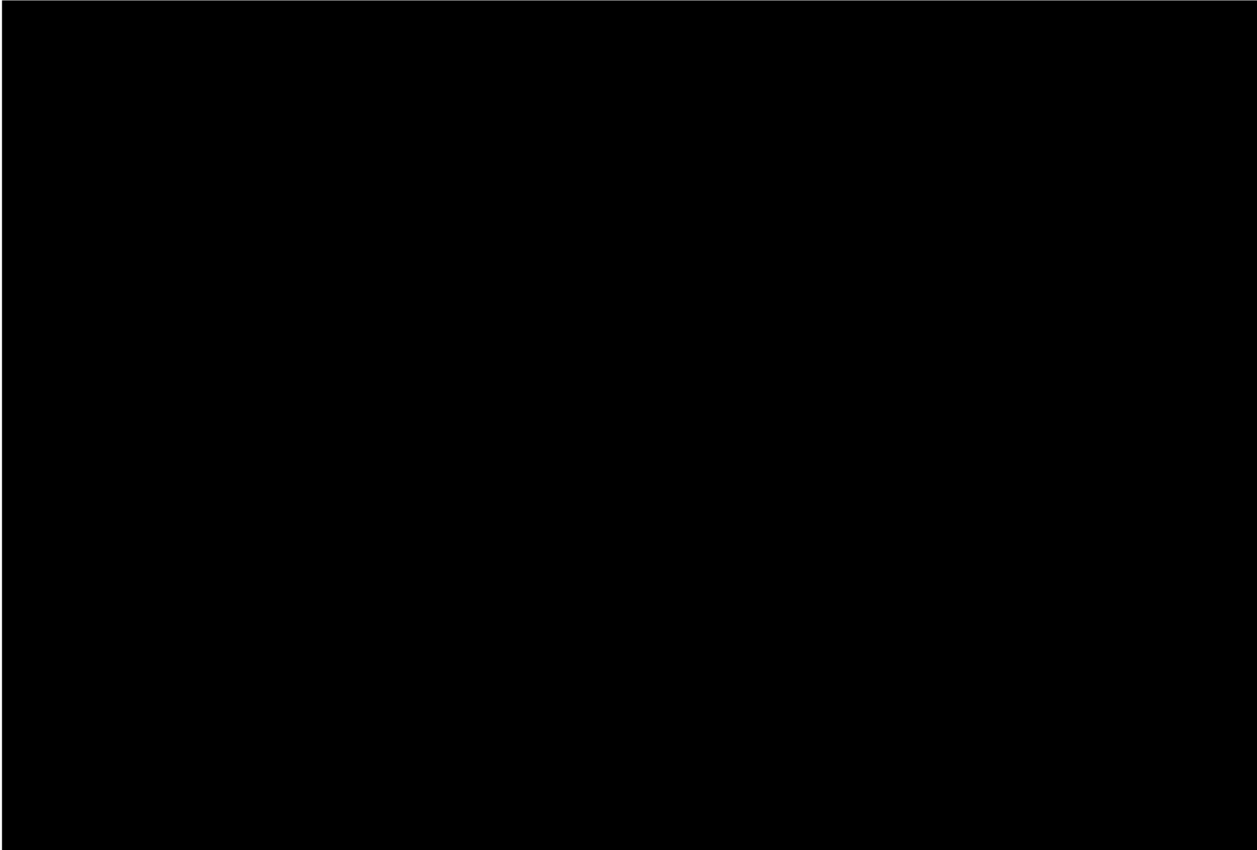


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
1[e] a sixth transistor which is coupled in series between the second transistor and an electroluminescent element and for providing the driving current for the electroluminescent element through the second transistor in response to the current light-emitting signal; and	The pixel circuit of the  has a sixth transistor that is coupled in series between the second transistor and an electroluminescent element and for providing the driving current for the electroluminescent element through the second transistor in response to the current light-emitting signal.  the sixth transistor T6 is coupled to the second transistor T1 and to an electroluminescent element (OLED).   sixth transistor T6 is in series between second transistor T1 and the OLED. In response to an active (low) current light-emitting signal delivered on emission line  sixth transistor T6 turns on and provides driving current that flows through second transistor T1 to the OLED. 

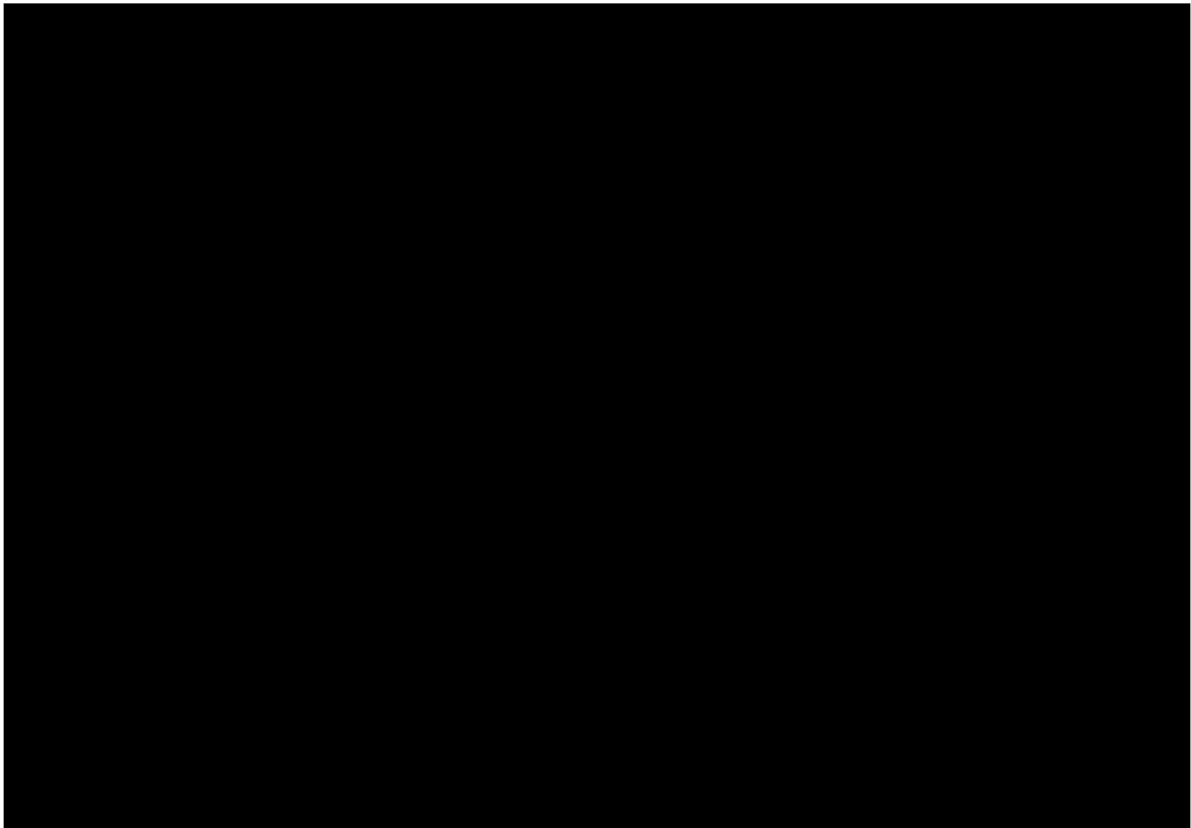


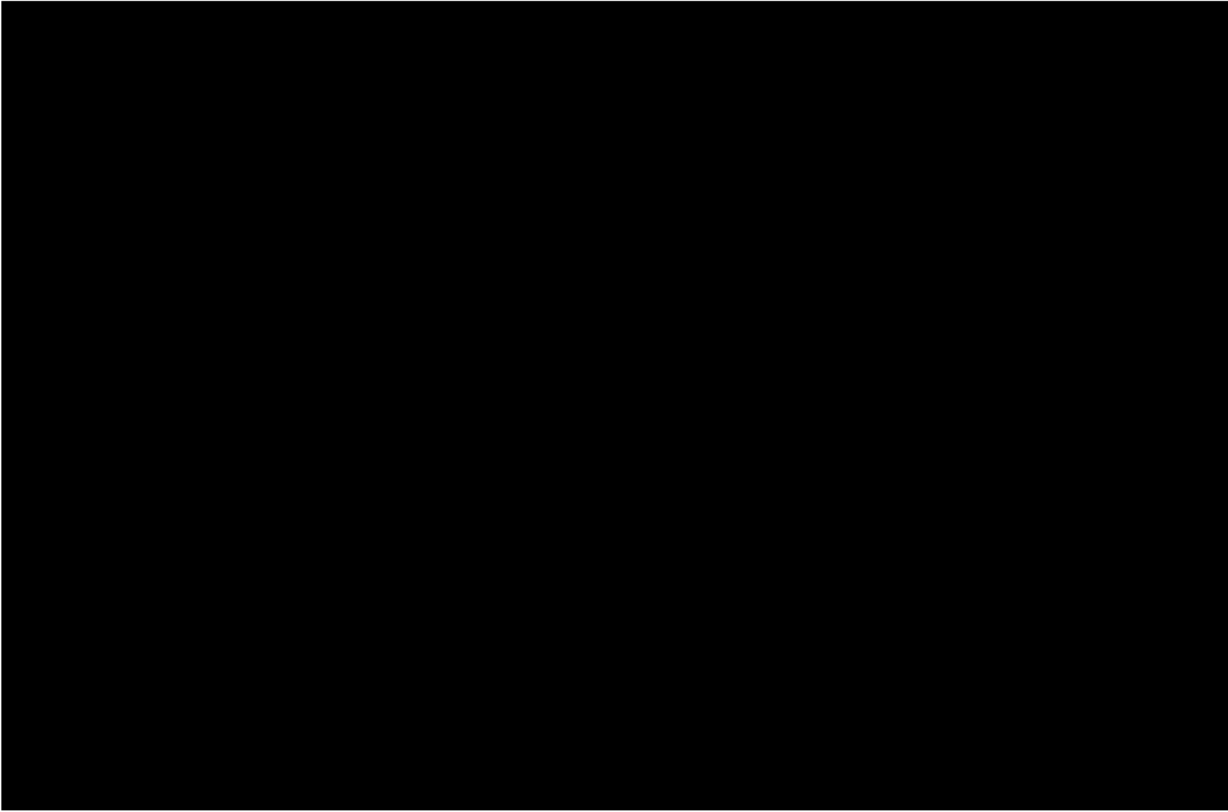
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
1[e] a sixth transistor which is coupled in series between the second transistor and an electroluminescent element and for providing the driving current for the electroluminescent element through the second transistor in response to the current light-emitting signal; and (<i>cont'd</i>)	As shown in the  sixth transistor T6 is coupled in series between second transistor T1 and the OLED. In response to an active (low) current light-emitting signal (blue line) delivered on emission line  sixth transistor T6 turns on, and the driving current flows (red line) from second transistor T1 through sixth transistor T6 to the OLED. 

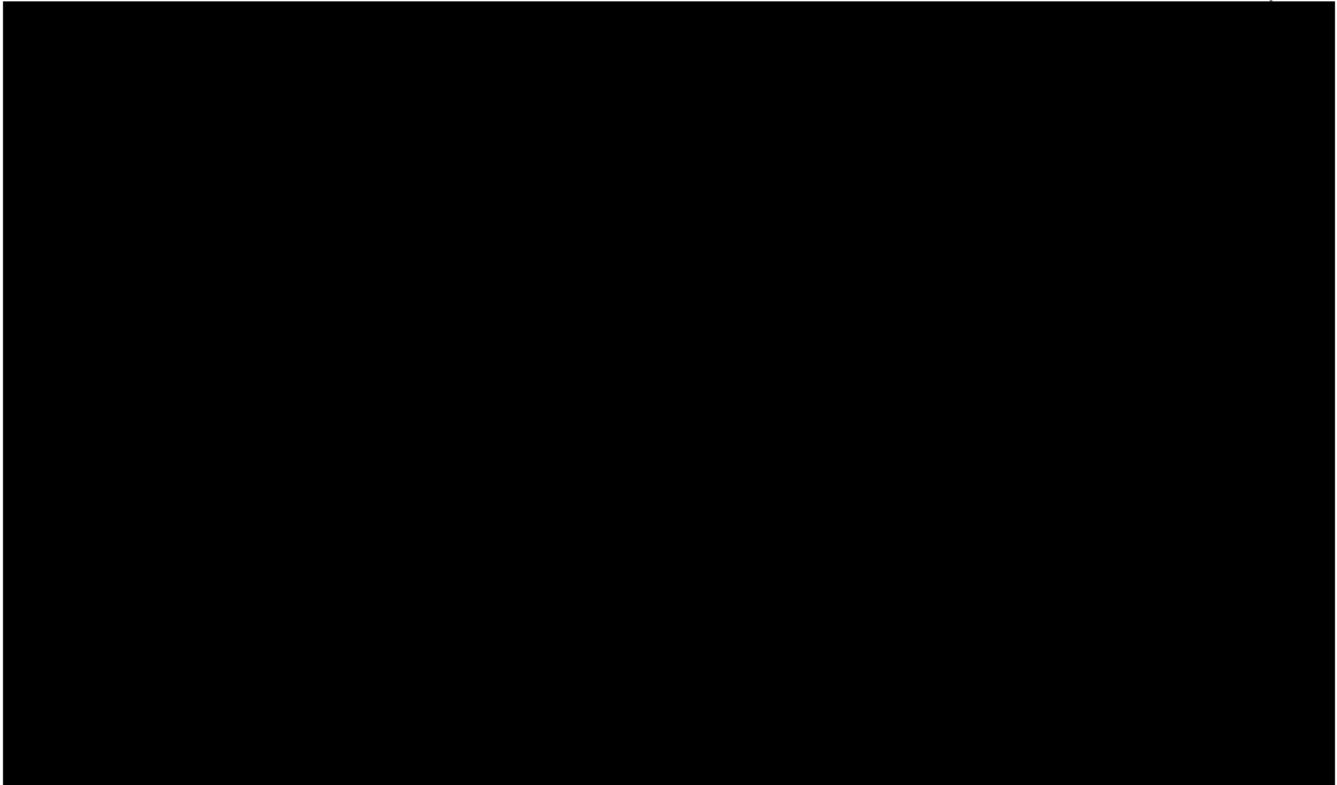
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[f] a capacitor for storing the data signal voltage delivered to the second transistor,	The pixel circuit of the [REDACTED] has a capacitor for storing the data signal voltage delivered to the second transistor. As shown in the [REDACTED] the capacitor [REDACTED] has an upper plate and a lower plate. The capacitor [REDACTED] stores the data signal voltage delivered to the second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) on data line [REDACTED] to second transistor T1 and to capacitor [REDACTED] (see also claim elements 1[a], 1[b] above). 

[REDACTED]

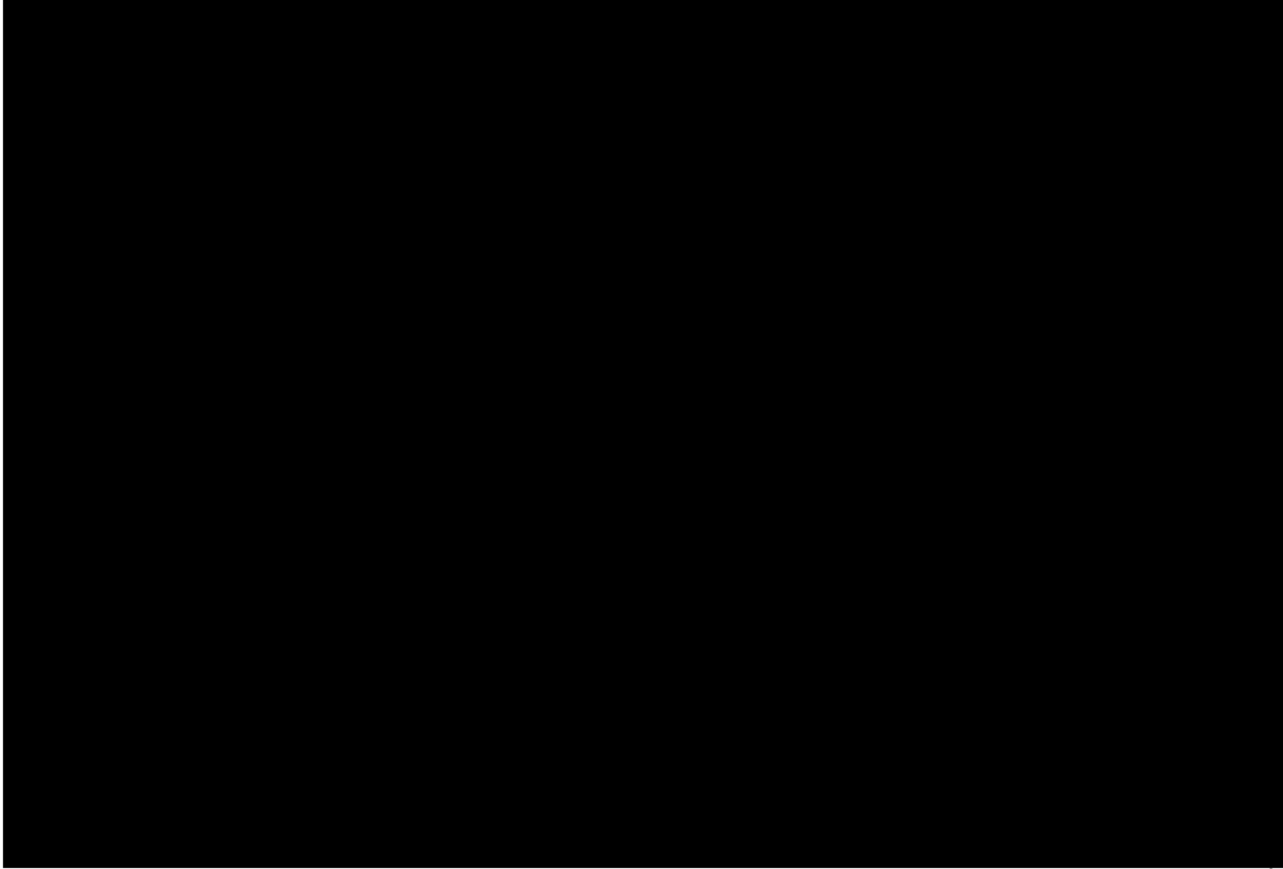
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[g] wherein the electroluminescent element emits light corresponding to the driving current generated through the second transistor.	In the pixel circuit of the [REDACTED] the electroluminescent element emits light corresponding to the driving current generated through the second transistor. [REDACTED] the driving current flows from a power supply voltage [REDACTED] through fifth transistor T5, through second transistor T1, and through sixth transistor T6 to the OLED. The amount of light emitted from the OLED corresponds to the driving current generated by second transistor T1 and delivered through the sixth transistor T6. 

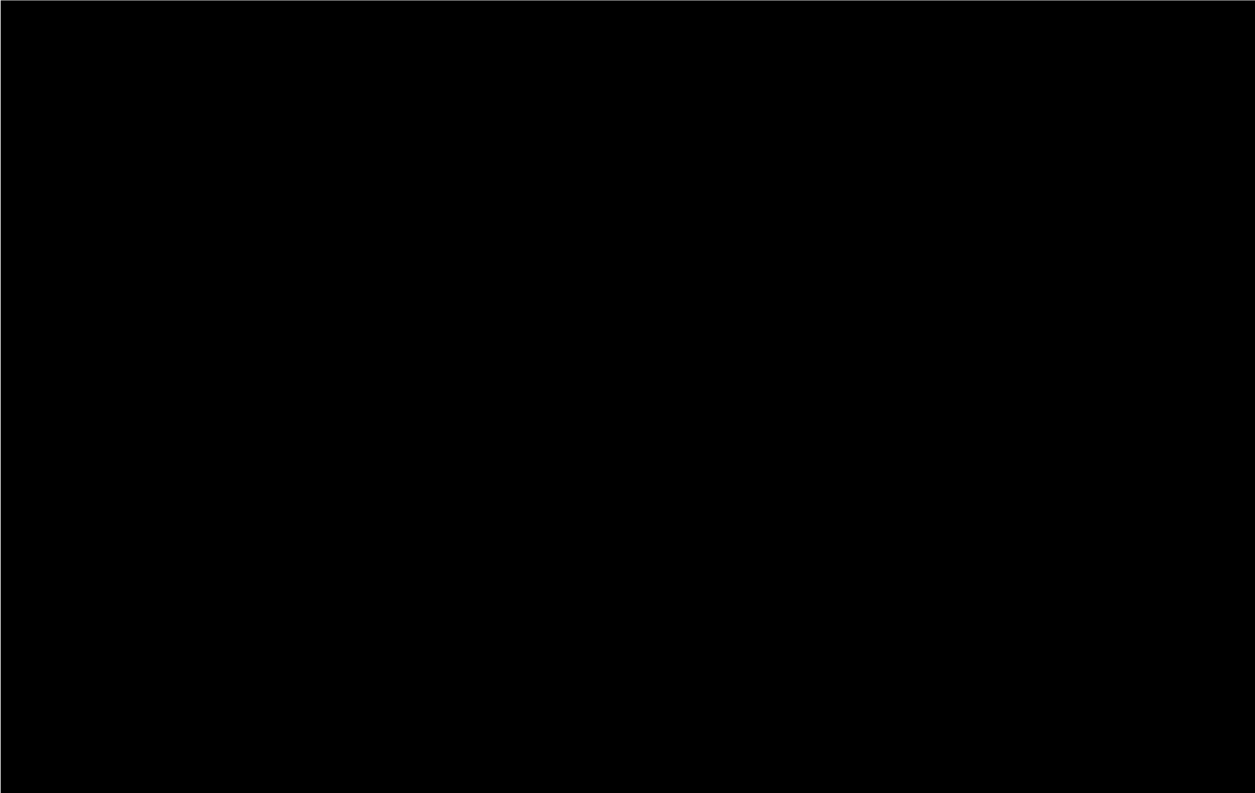
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
1[g] wherein the electroluminescent element emits light corresponding to the driving current generated through the second transistor. (<i>cont'd</i>)	As reflected in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] transistors T5 and T6 turn on, and current (red line) can flow from [REDACTED] through transistors T5-T1-T6 to the OLED. The voltage stored by capacitor [REDACTED] (see also claim element 1[f], above) is applied to the gate of second transistor T1, and this applied voltage determines the amount of driving current that flows through second transistor T1 to the OLED, which in turn determines the amount of light emitted by the OLED. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
2. The pixel circuit in the organic light emitting device of claim 1, further comprising: a fourth initialization transistor for discharging the data signal voltage stored in the capacitor in response to a scan signal just before the current scan signal.	The pixel circuit of the [REDACTED] has a fourth initialization transistor for discharging the data signal voltage stored in the capacitor in response to a scan signal just before the current scan signal. As shown in the [REDACTED] the fourth transistor T4 is coupled between an initialization voltage line [REDACTED] and the capacitor [REDACTED]. The fourth transistor T4 turns on in response to an active (low) scan signal (blue line) on scan line [REDACTED] that is a scan signal just before the current scan signal on scan line [REDACTED]. The data signal voltage stored in the capacitor [REDACTED] is discharged (red line) through fourth transistor T4 to initialization voltage line [REDACTED]. 

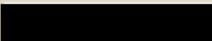
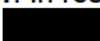
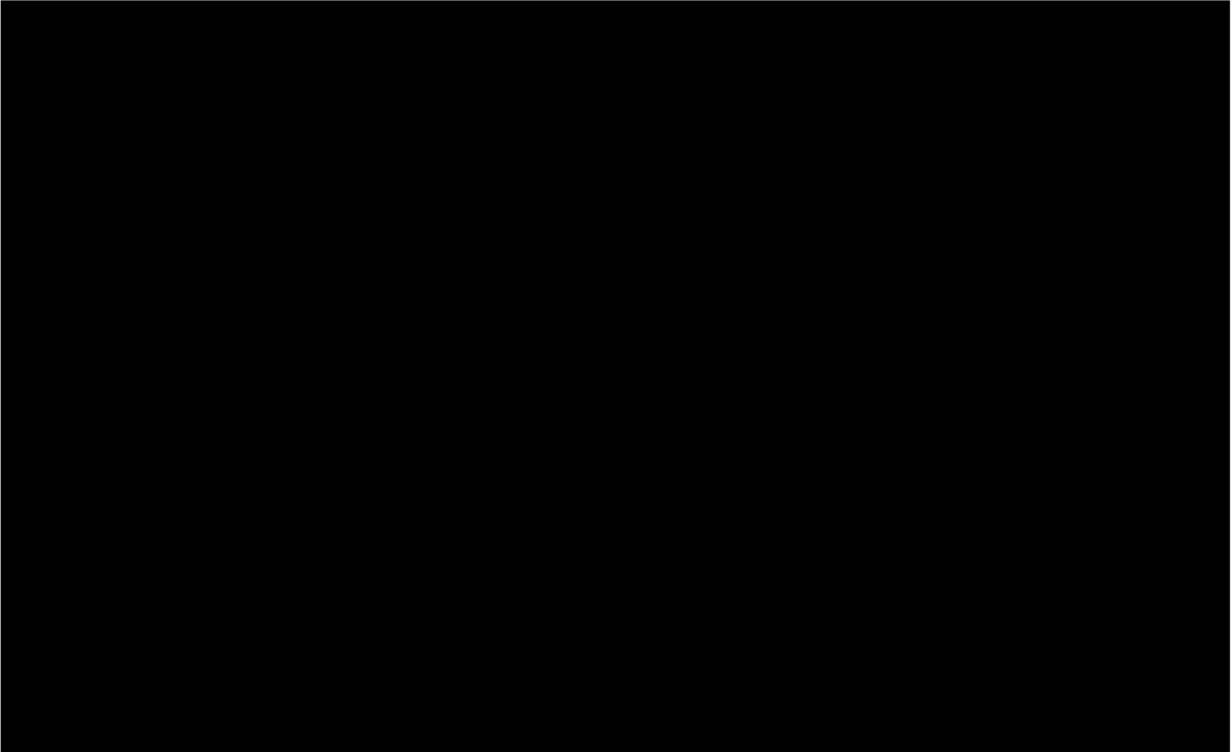
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
2. The pixel circuit in the organic light emitting device of claim 1, further comprising: a fourth initialization transistor for discharging the data signal voltage stored in the capacitor in response to a scan signal just before the current scan signal. (cont'd)	As shown in the timing diagram below, the active (low) scan signal on scan line [REDACTED] is a scan signal just before the current scan signal on scan line [REDACTED]. As discussed previously, the fourth transistor T4 turns on in response to an active (low) scan signal is delivered on scan line [REDACTED] just before the current scan signal is delivered on scan line [REDACTED]. The data signal voltage stored in the capacitor [REDACTED] is discharged through fourth transistor T4 to initialization voltage line [REDACTED]. [REDACTED]

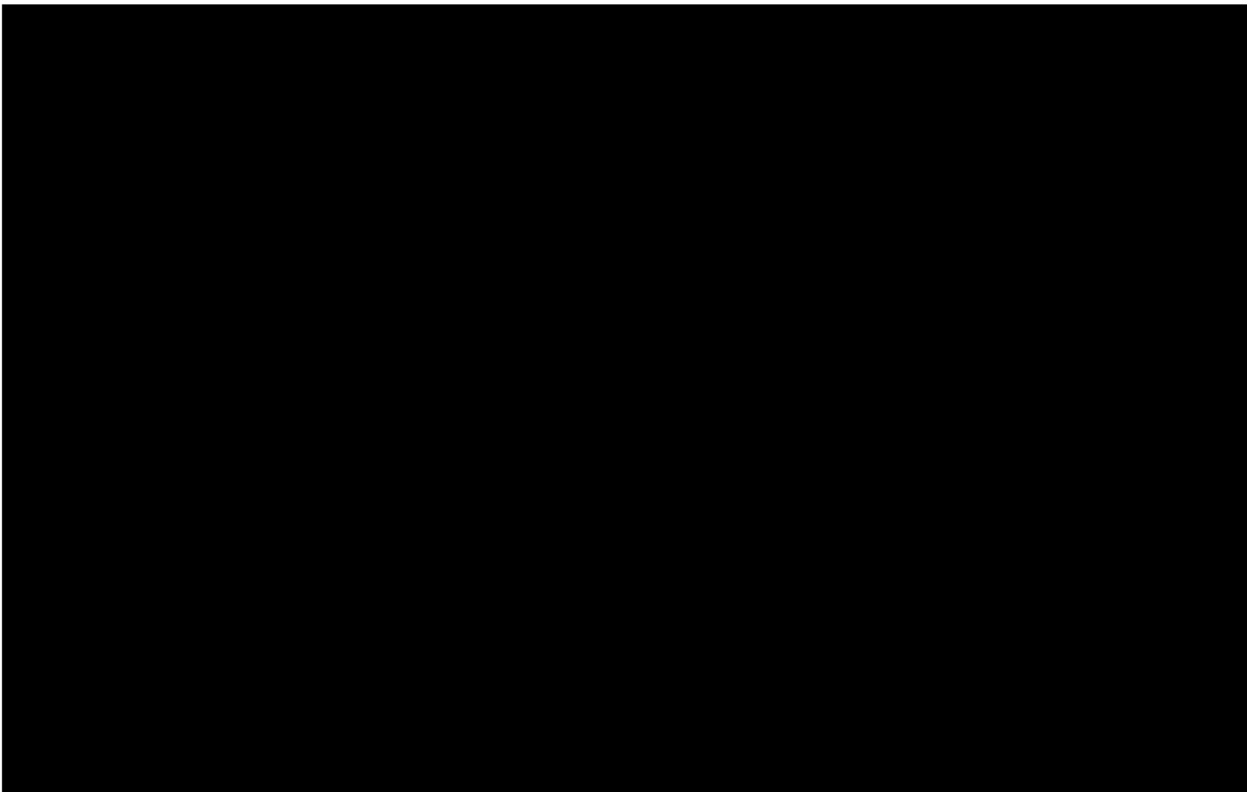


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
3. The pixel circuit in the organic light emitting device of claim 1, wherein the first transistor is composed of a PMOS transistor including a gate to which the current scan line signal is applied, a source to which the data signal voltage is applied, and a drain coupled to the second transistor.	The pixel circuit of the  has a first transistor composed of a PMOS transistor, including a gate to which the current scan line signal is applied, a source to which the data signal voltage is applied, and a drain coupled to the second transistor. As shown in the  the circuit symbol for the first transistor T2 indicates that it is a PMOS transistor. As shown in the  the first transistor T2 includes a gate to which the current scan line signal delivered on scan line  is applied, a source to which the data signal voltage from data line  is applied, and a drain coupled to the second transistor T1. 

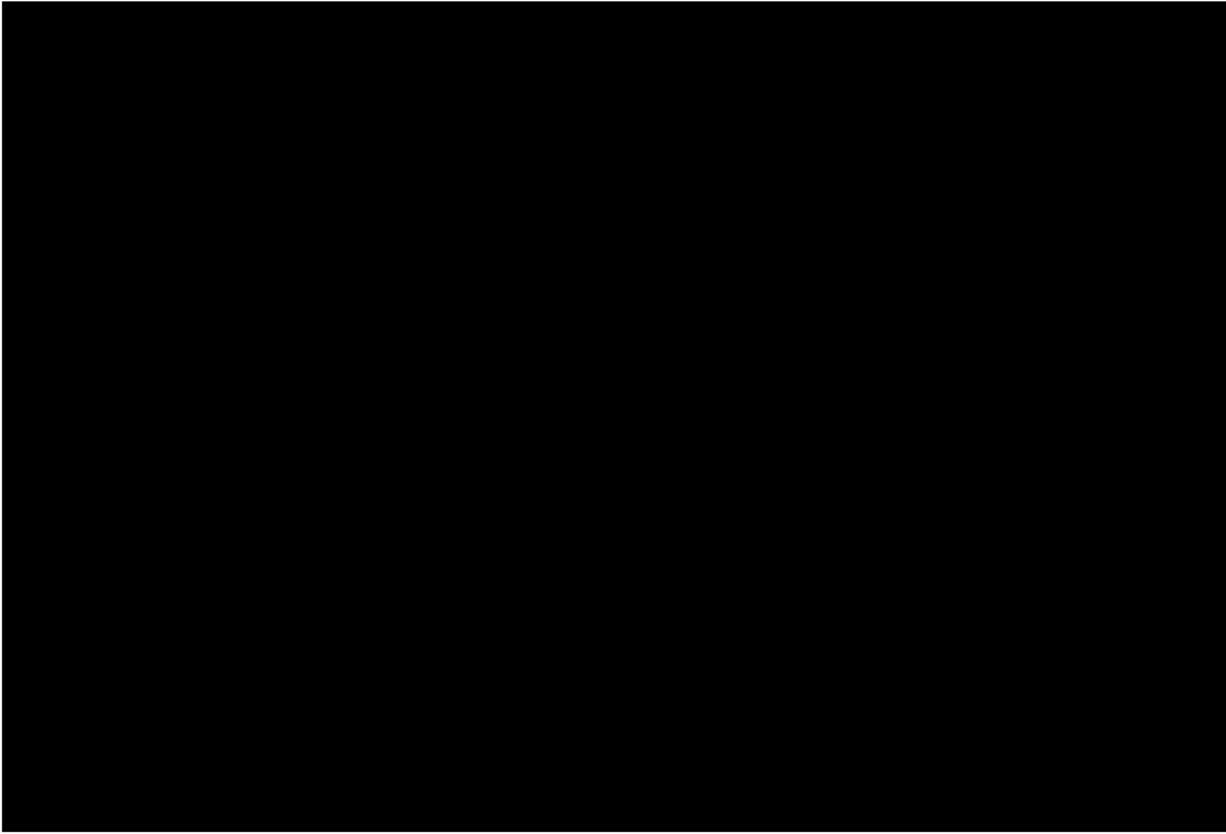
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
4. The pixel circuit in the organic light emitting device of claim 1, wherein the second transistor is composed of a PMOS transistor including a gate coupled to one terminal of the capacitor, a source coupled to the first transistor, and a drain coupled to the electroluminescent element.	The pixel circuit of the [REDACTED] has a second transistor composed of a PMOS transistor, including a gate coupled to one terminal of the capacitor, a source coupled to the first transistor, and a drain coupled to the electroluminescent element. [REDACTED] the circuit symbol for the second transistor T1 indicates that it is a PMOS transistor. [REDACTED] the second transistor T1 includes a gate coupled to one terminal of the capacitor [REDACTED] a source coupled to the first transistor T2, and a drain coupled to the electroluminescent element through sixth transistor T6. 



U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
5. The pixel circuit in the organic light emitting device of claim 4, wherein the third transistor is composed of a PMOS transistor including a gate to which the current scan signal is applied, and a drain and a source which are coupled to the gate and the drain of the second transistor, respectively, so that the third transistor connects the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor.	The pixel circuit of the  has a third transistor composed of a PMOS transistor, including a gate, to which the current scan signal is applied, and a drain and a source that are coupled to the gate and the drain of the second transistor, respectively, so that the third transistor connects the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor. As shown in the  the circuit symbol for the third transistor T3 indicates that it is a PMOS transistor. As shown in the  the third transistor T3 includes a gate to which the current scan signal delivered on scan line  is applied, a drain coupled to the gate of the second transistor T1, and source coupled to the drain of second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line  third transistor T3 connects the drain and gate of second transistor T1 together (red line) in the form of a diode to self-compensate a threshold voltage of second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
6. The pixel circuit in the organic light emitting device of claim 1, further comprising: a voltage source for providing the data signal voltage through the first transistor for the second transistor.	In the pixel circuit of the [REDACTED] a voltage source for providing the data signal voltage through the first transistor for the second transistor is shown. As shown in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] the first transistor T2 turns on and provides the data signal voltage (red line) from the data line [REDACTED] to the second transistor T1. 

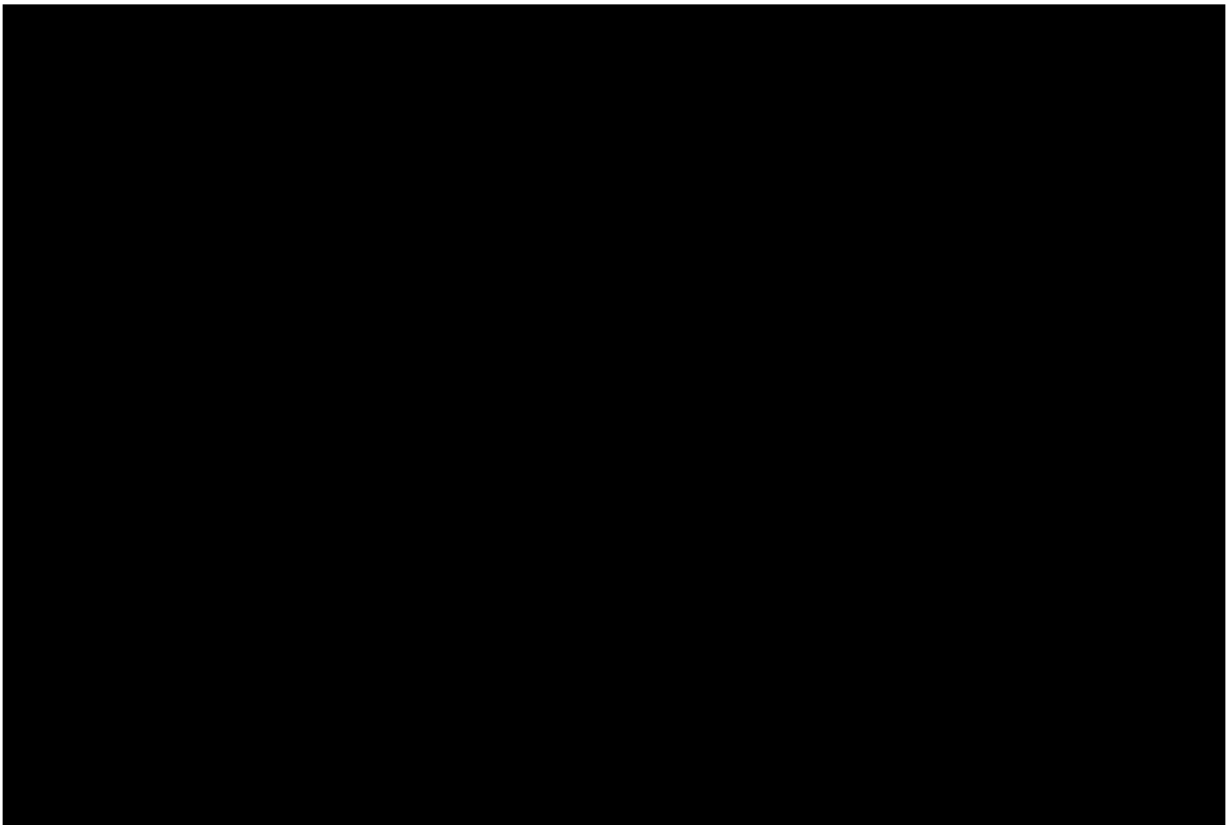
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[preamble] A pixel circuit in an organic light emitting device, comprising:	The [REDACTED] includes a pixel circuit in an organic light-emitting device. For example, the [REDACTED] below of the [REDACTED] depicts the transistors T1–T7, the capacitor [REDACTED] and the OLED element. 

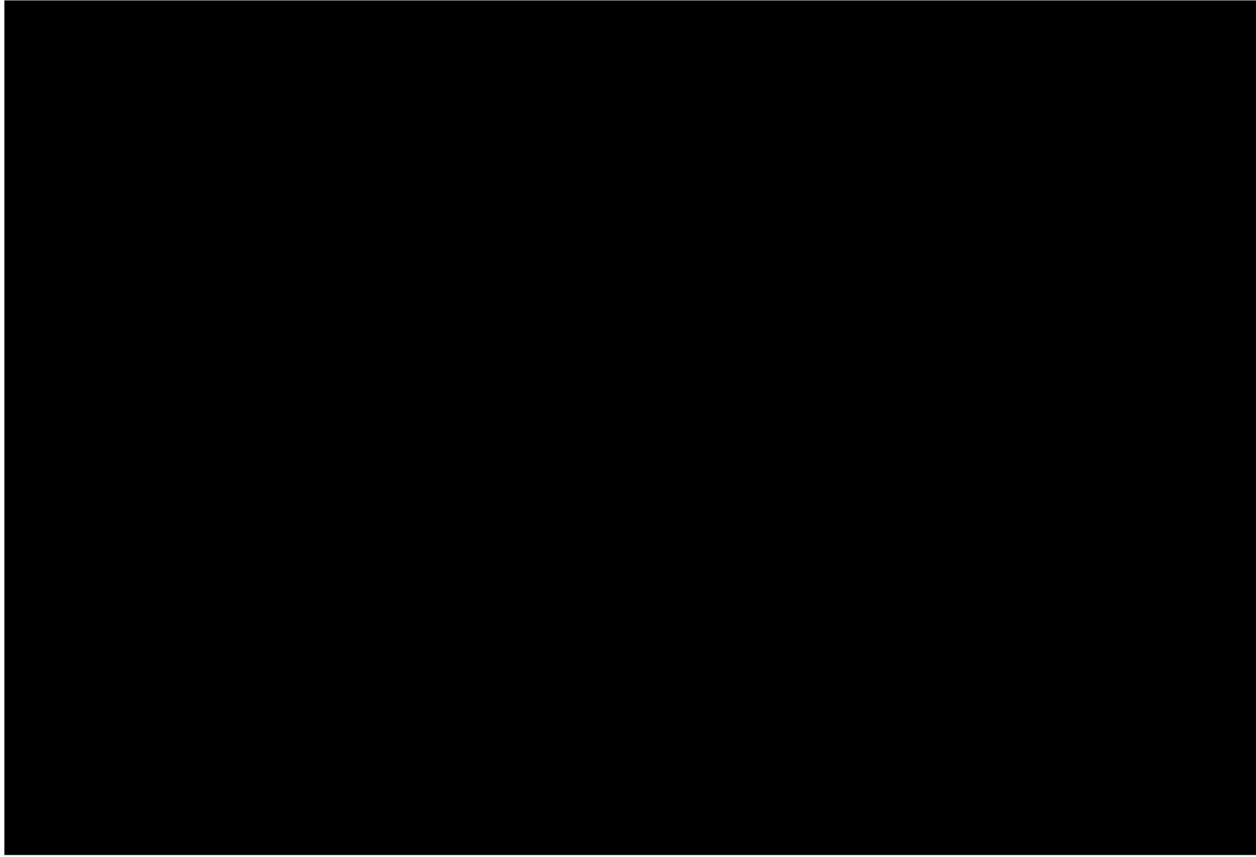


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[preamble] A pixel circuit in an organic light emitting device, comprising: <i>(cont'd)</i>	 Ex. 2020 (Galaxy S21 Teardown Photos) at 2

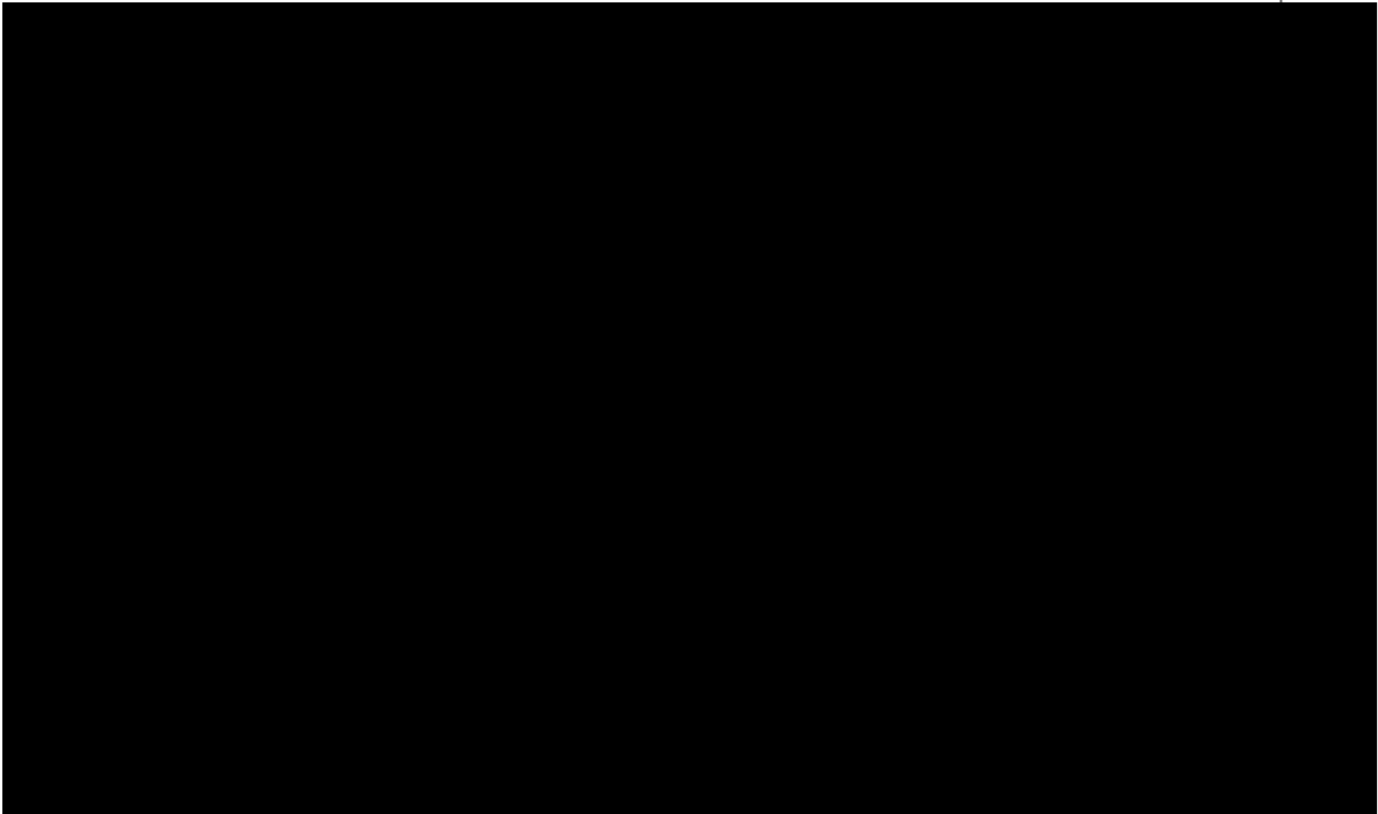
[REDACTED]

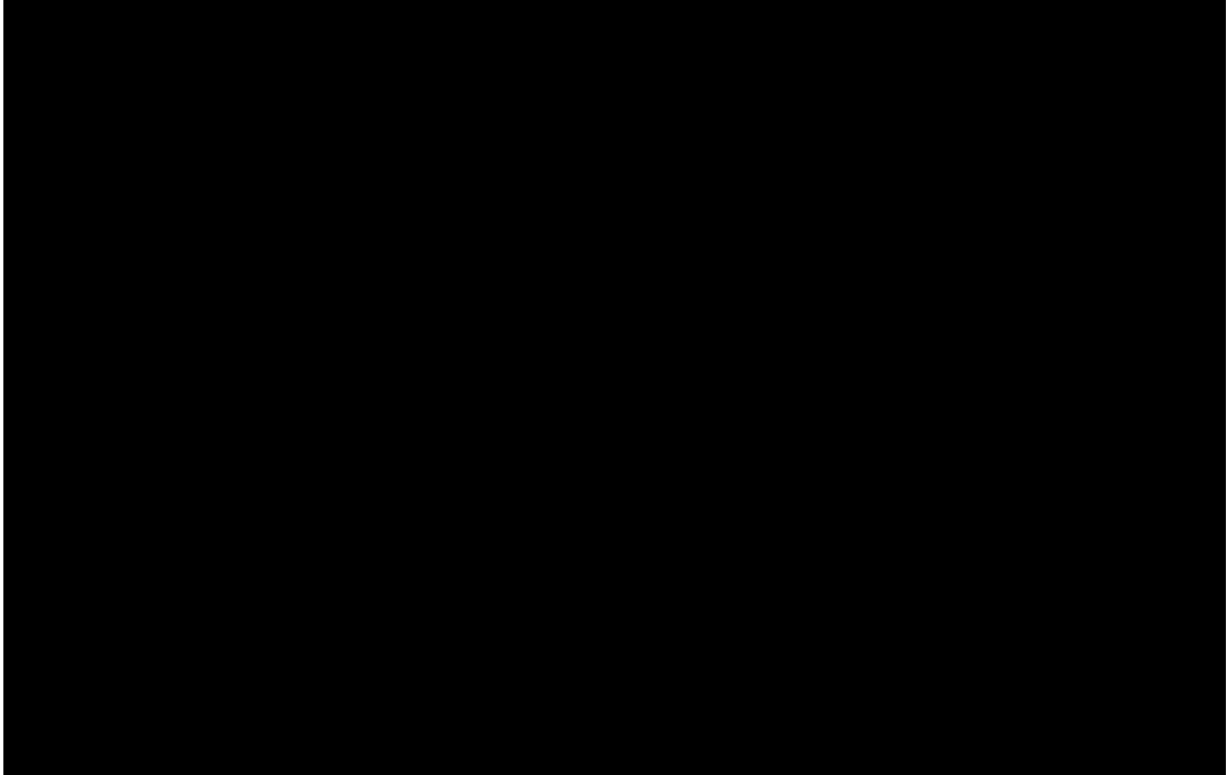
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[a] a first transistor for delivering a data signal voltage in response to a current scan line signal;	The pixel circuit of the [REDACTED] has a first transistor for delivering a data signal voltage in response to a current scan line signal. [REDACTED] the first transistor T2 is coupled to a data line [REDACTED] for delivering a data signal voltage. The gate of first transistor T2 is coupled to a scan line [REDACTED] that delivers a current scan line signal to the gate of first transistor T2. In response to an active (low) current scan line signal delivered on scan line [REDACTED] first transistor T2 delivers a data signal voltage from data line [REDACTED] 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[a] a first transistor for delivering a data signal voltage in response to a current scan line signal; (<i>cont'd</i>)	As reflected in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) present on data line [REDACTED]. The annotated [REDACTED] below depicts an exemplary voltage path from data line [REDACTED] through transistors T2-T1-T3 to the gate of transistor T1. 

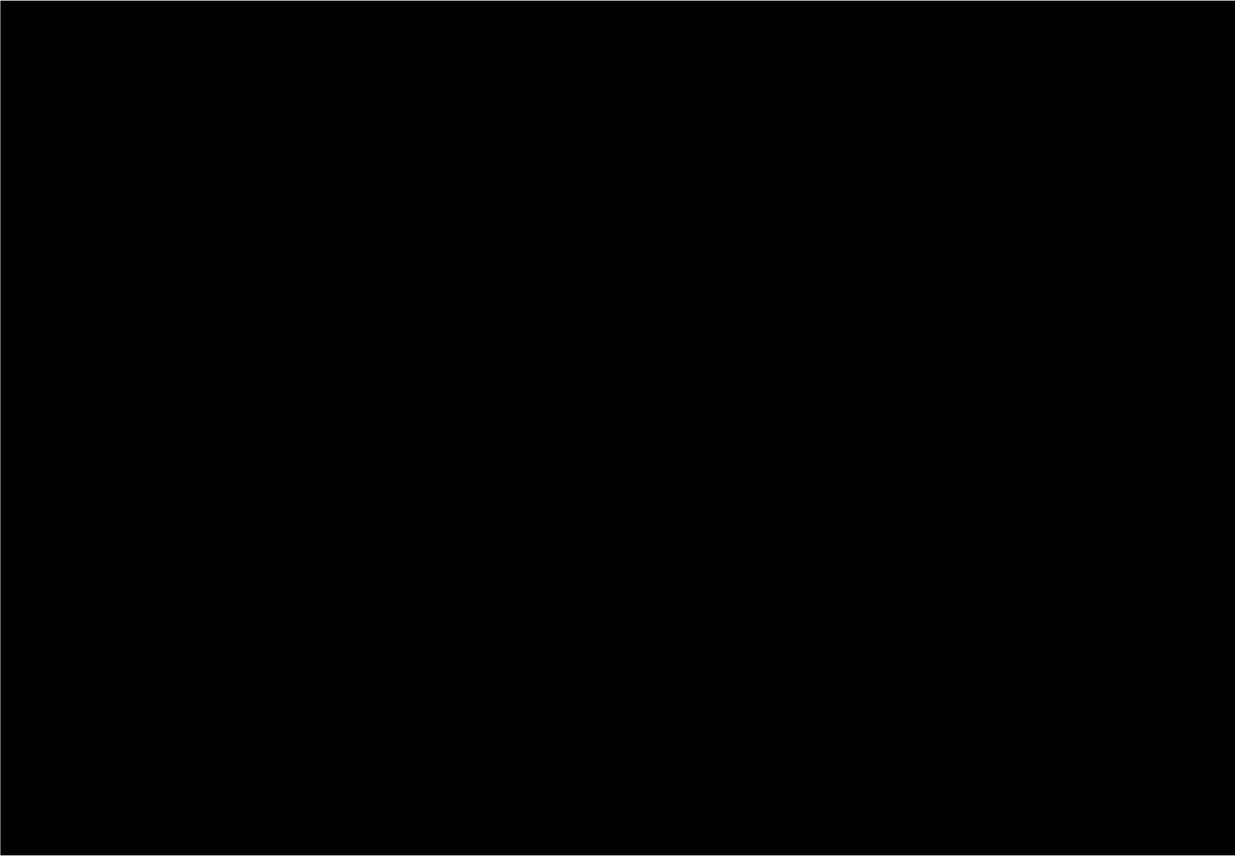
[REDACTED]

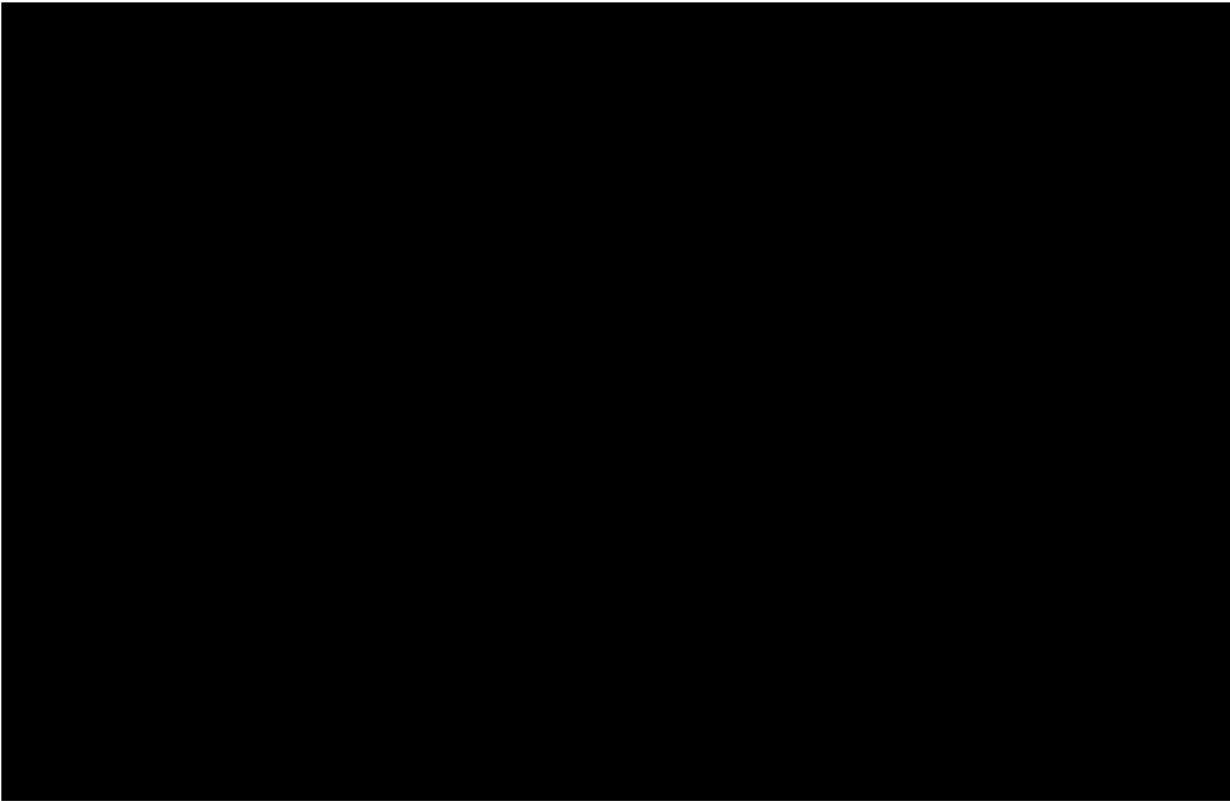
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[b] a second transistor for programming the data signal voltage and for generating a driving current in response to a programmed data signal when light is emitted;	The pixel circuit of the [REDACTED] has a second transistor for programming the data signal voltage and for generating a driving current in response to a programmed data signal when light is emitted. As shown in the [REDACTED] the second transistor T1 is coupled to a power supply voltage [REDACTED] As described for claim element 1[a] above, the first transistor T2 delivers a data signal voltage in response to an active (low) current scan line signal that is delivered on scan line [REDACTED] The data signal voltage is stored (programmed) on the capacitor [REDACTED] When light is emitted, the second transistor T1 will generate a driving current dependent upon the voltage stored on the capacitor [REDACTED] and the current will be sourced from [REDACTED] 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[b] a second transistor for programming the data signal voltage and for generating a driving current in response to a programmed data signal when light is emitted; (<i>cont'd</i>)	As further reflected in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] transistors T5 and T6 turn on, and a driving current (red line) flows from [REDACTED] through second transistor T1 to the OLED. The amount of current that flows through second transistor T1 to the OLED is dependent upon the voltage that was stored (programmed) on the capacitor [REDACTED] which is based on the data signal voltage delivered previously through first transistor T2 (see claim element 7[d], below). 

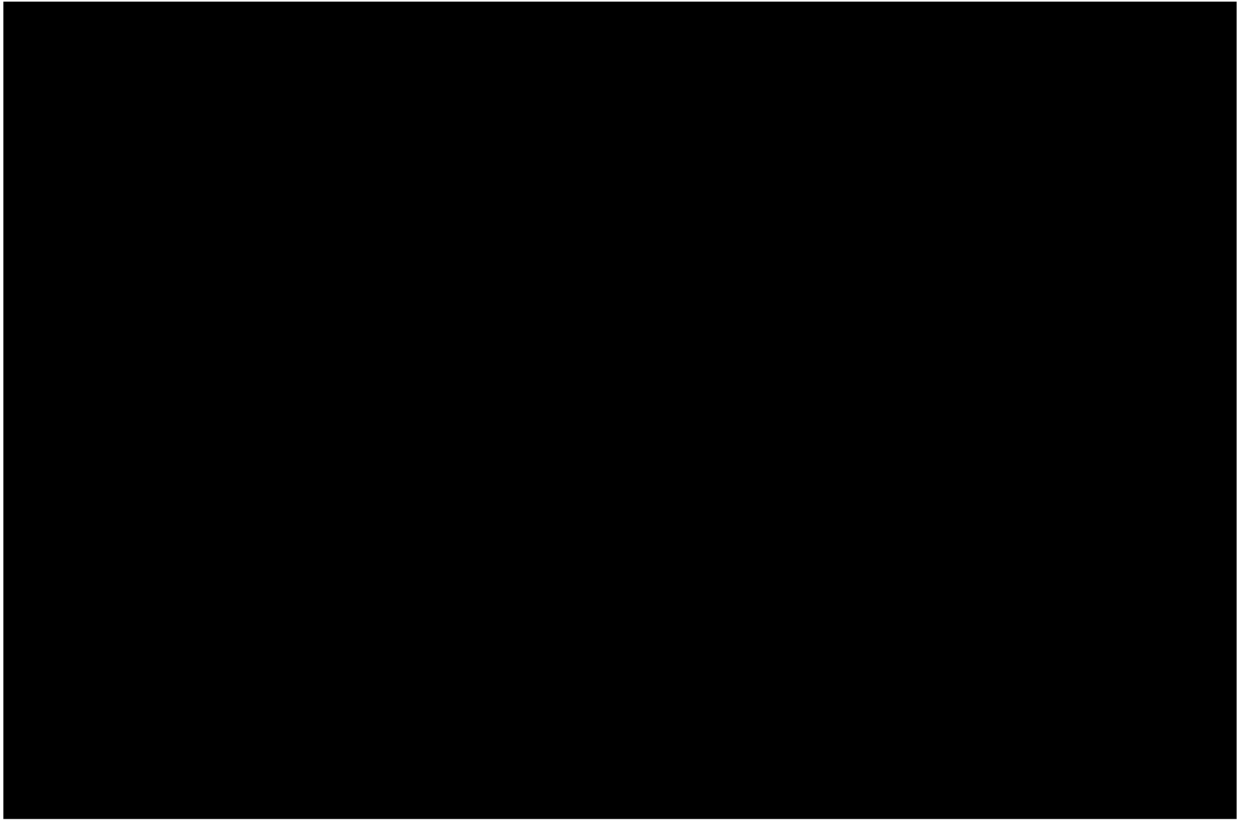
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[c] a third transistor for providing the data signal voltage for the second transistor in response to the current scan signal;	The pixel circuit of the [REDACTED] has a third transistor for providing the data signal voltage for the second transistor in response to the current scan signal. [REDACTED] [REDACTED] a third transistor T3 provides the data signal voltage for the second transistor T1 in response to the current scan signal deliver on scan line [REDACTED] 

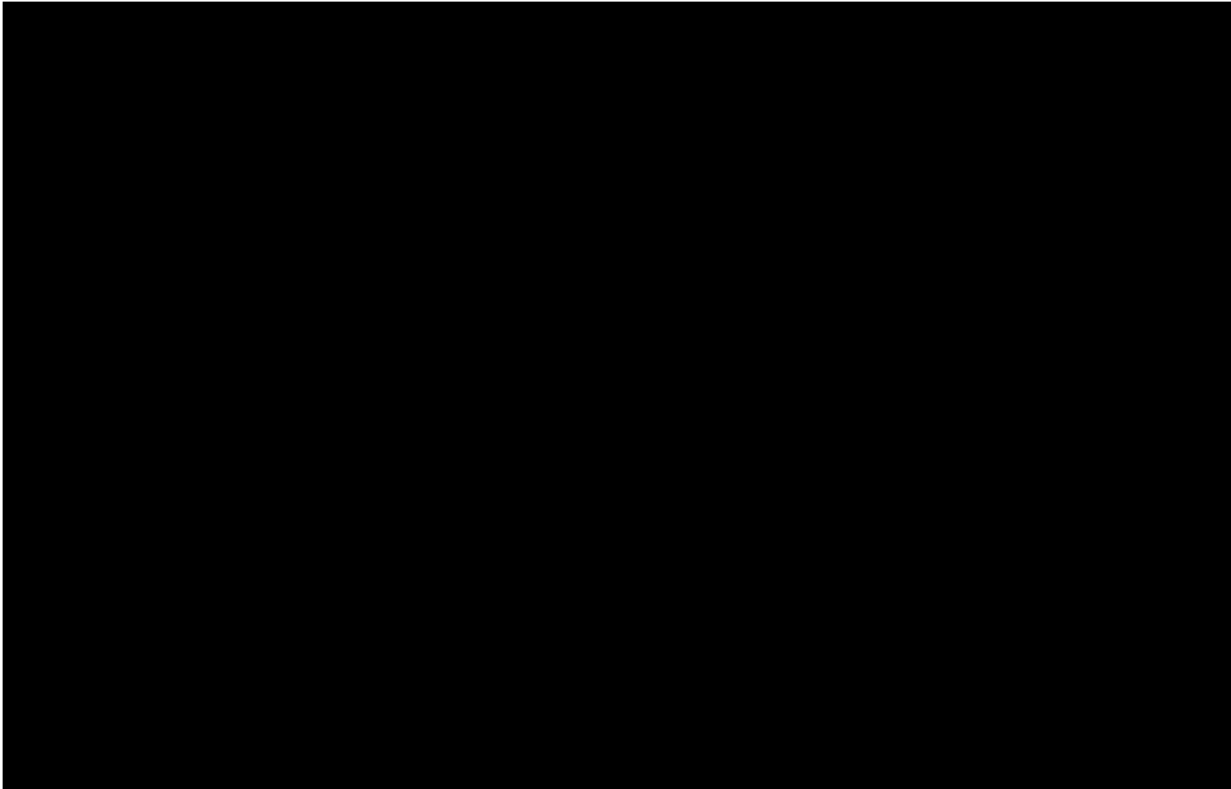
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[c] a third transistor for providing the data signal voltage for the second transistor in response to the current scan signal; (cont'd)	As reflected in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] transistors T2 and T3 turn on and a data signal voltage (red line) on data line [REDACTED] flows through transistors T2-T1-T3 and is stored on the capacitor [REDACTED] and the gate of second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[d] a capacitor for maintaining the data signal voltage programmed onto the second transistor;	The pixel circuit of the [REDACTED] has a capacitor for maintaining the data signal voltage programmed onto the second transistor. As shown in the [REDACTED] the capacitor [REDACTED] has an upper plate and a lower plate. The capacitor [REDACTED] maintains the data signal voltage delivered to and stored (programmed) on the gate of the second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) on data line [REDACTED] to second transistor T1 and to capacitor [REDACTED] (see <i>a/so</i> claim elements 7[a], 7[b] above). 

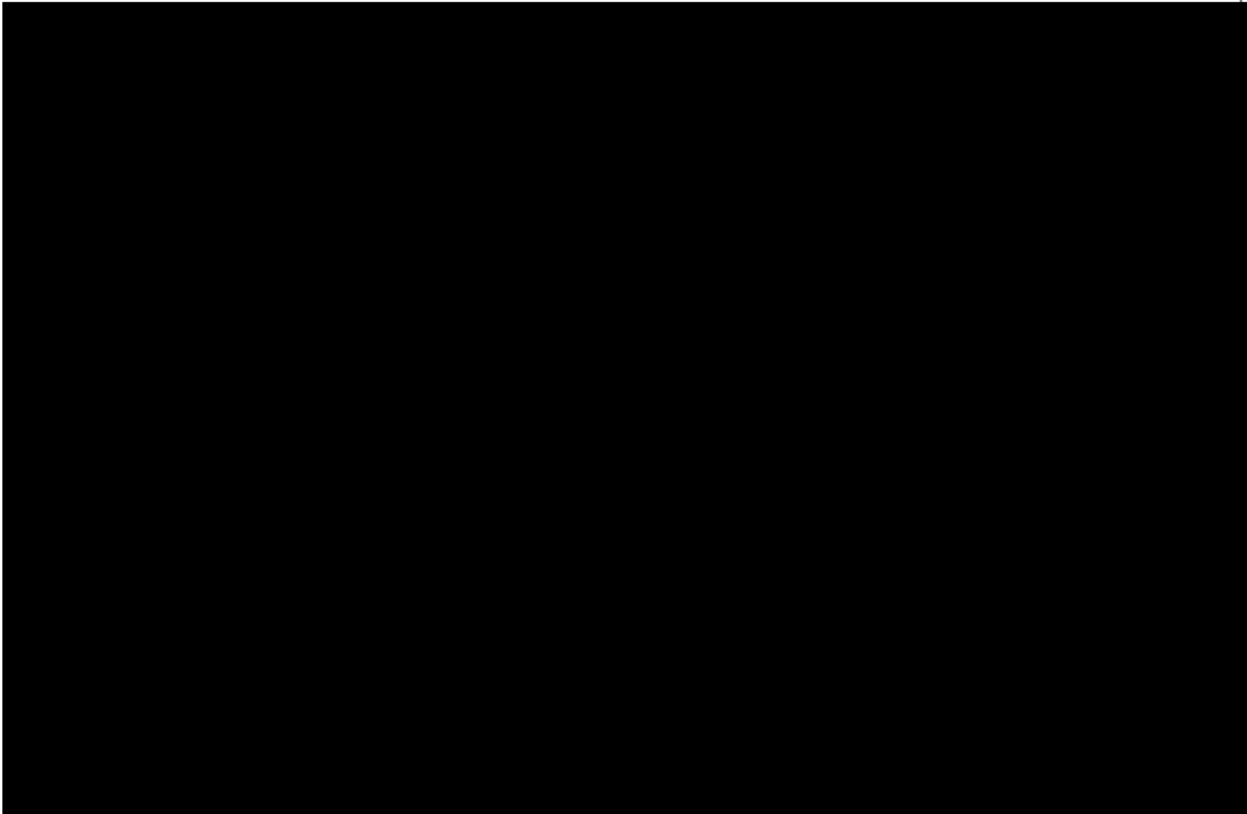
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[e] a fourth transistor for delivering a power supply voltage to the second transistor when the light is emitted;	The pixel circuit of the [REDACTED] has a fourth transistor for delivering a power supply voltage to the second transistor when the light is emitted. [REDACTED] the fourth transistor T5 is coupled to a power supply voltage [REDACTED] and second transistor T1. In response to an active (low) current light-emitting signal delivered on emission line [REDACTED] fourth transistor T5 delivers a power supply voltage from [REDACTED] to second transistor T1 when the light is emitted. 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[e] a fourth transistor for delivering a power supply voltage to the second transistor when the light is emitted; (<i>cont'd</i>)	For example, as shown in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] fourth transistor T5 turns on and provides a power supply voltage [REDACTED] (red line) to second transistor T1 when the light is emitted. 

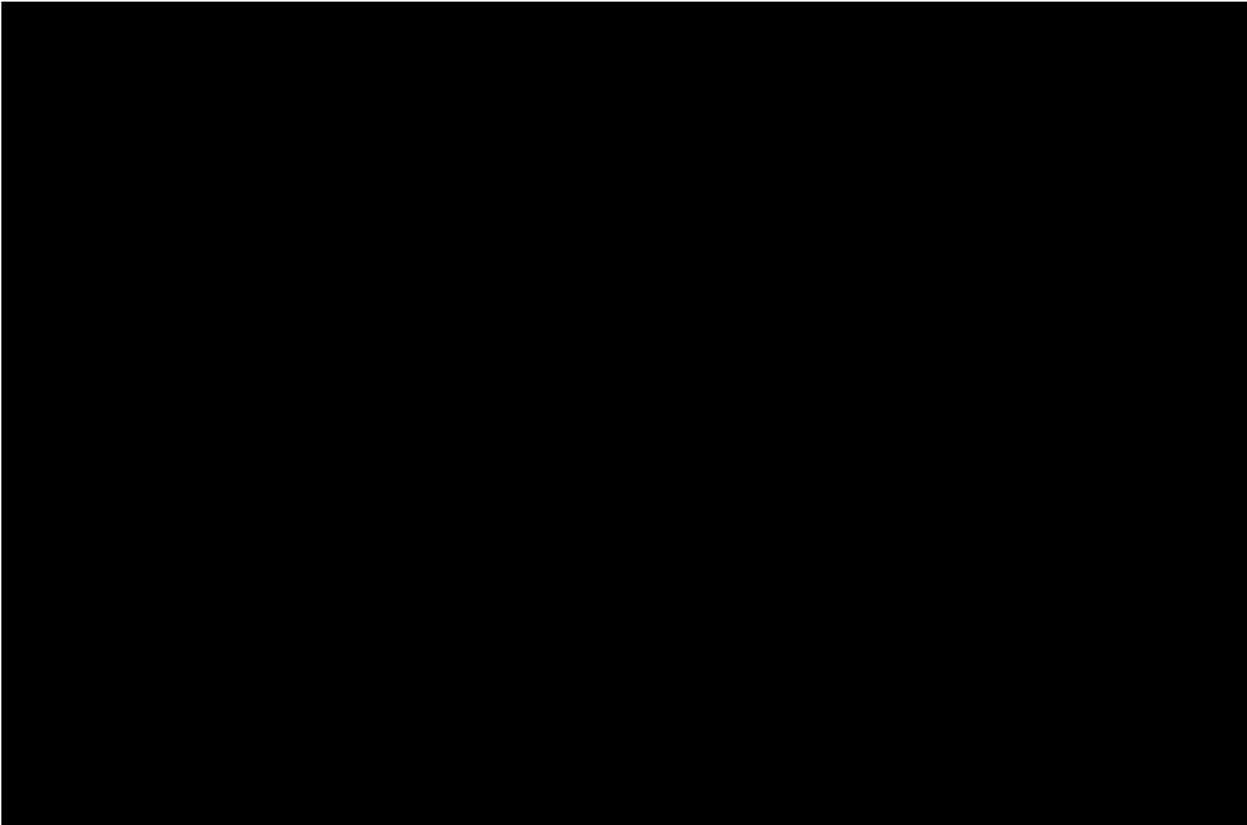
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[f] a fifth transistor for delivering the driving current, provided from the second transistor, in response to the data signal voltage when the light is emitted; and	The pixel circuit of the [REDACTED] has a fifth transistor for delivering the driving current, provided from the second transistor, in response to the data signal voltage when the light is emitted. [REDACTED] the fourth transistor T6 is coupled to the second transistor T1 and to an electroluminescent element (OLED). [REDACTED] fourth transistor T6 is in series between second transistor T1 and the OLED. In response to an active (low) current light-emitting signal delivered on emission line [REDACTED] fourth transistor T6 turns on and delivers driving current that flows through second transistor T1 to the OLED when the light is emitted. 

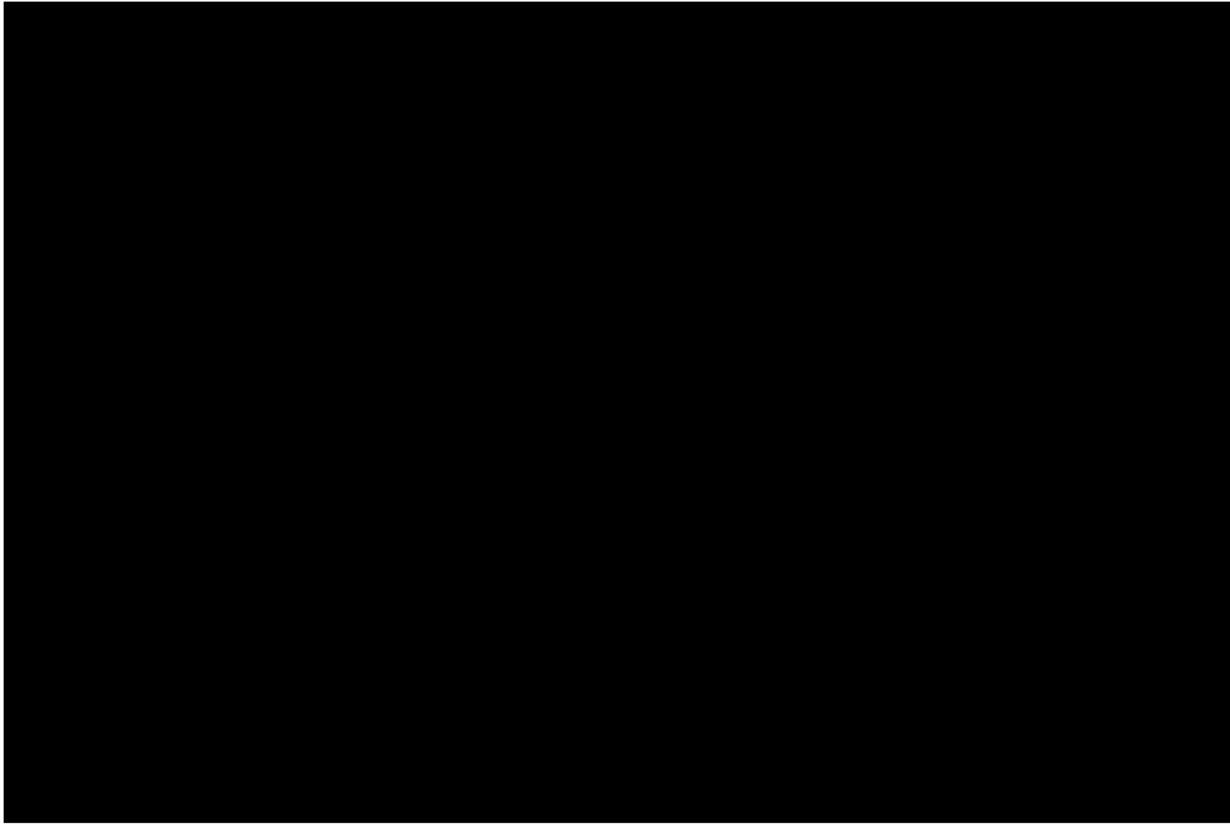
[REDACTED]

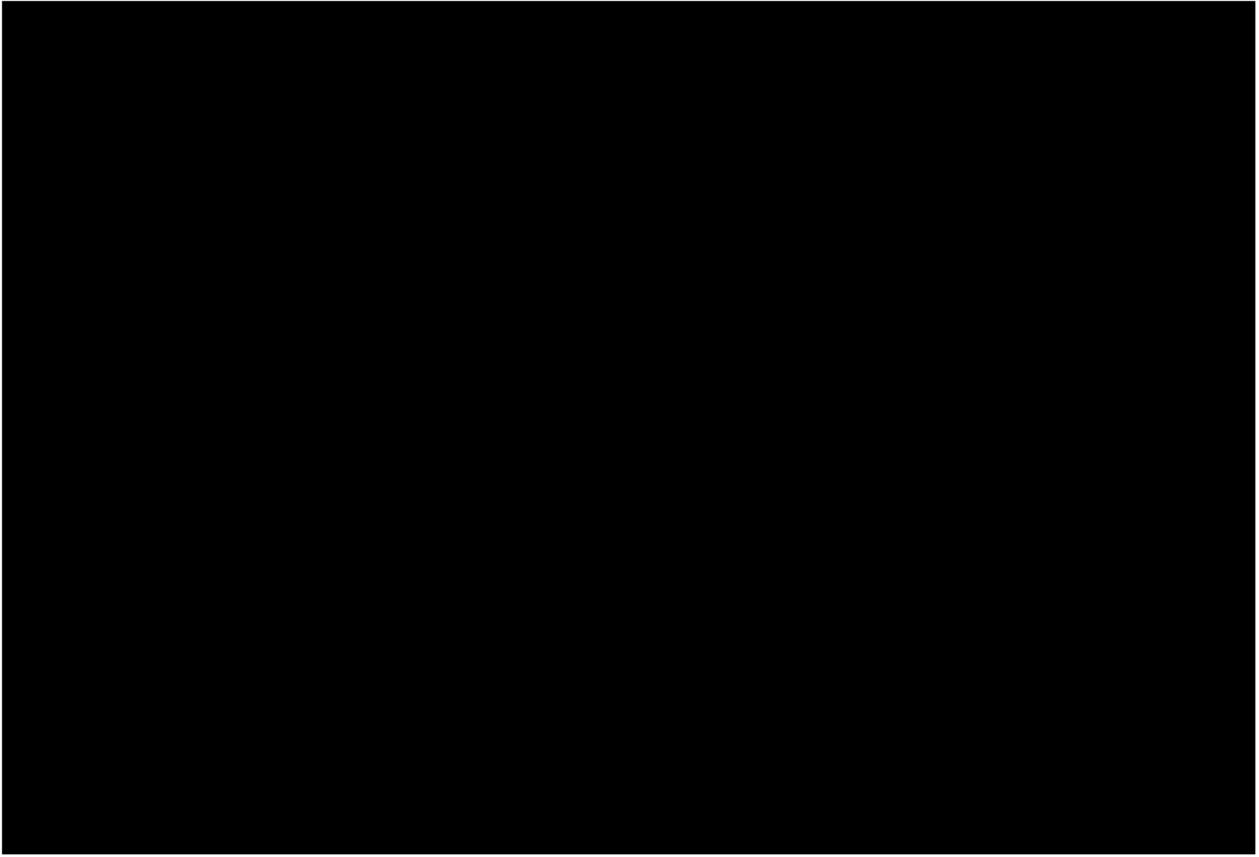
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[f] a fifth transistor for delivering the driving current, provided from the second transistor, in response to the data signal voltage when the light is emitted; and (cont'd)	As is further shown in the [REDACTED] fifth transistor T6 is coupled in series between second transistor T1 and the OLED. In response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] fifth transistor T6 turns on, and the driving current flows (red line) from second transistor T1 through fifth transistor T6 to the OLED when the light is emitted.

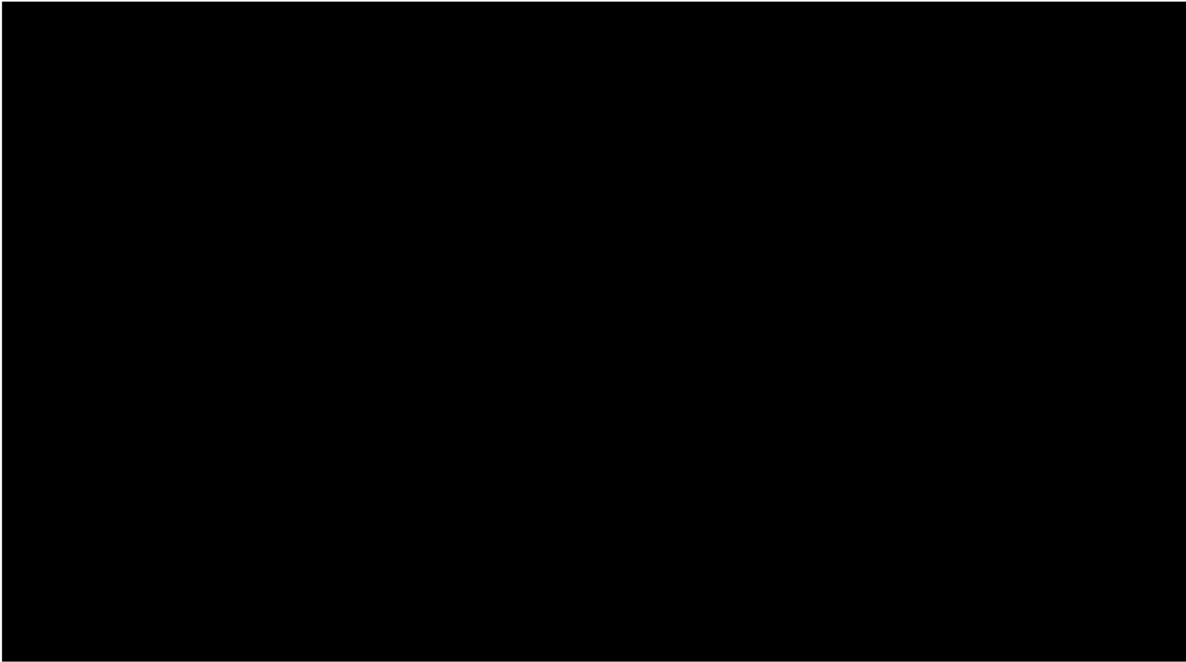
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[g] an electroluminescent element for emitting light corresponding to the driving current delivered through the fifth transistor,	The pixel circuit of the [REDACTED] has an electroluminescent element for emitting light corresponding to the driving current delivered through the fifth transistor. [REDACTED] the driving current flows from a power supply voltage [REDACTED] through fourth transistor T5, through second transistor T1, and through fifth transistor T6 to the OLED. The amount of light emitted from the OLED corresponds to the driving current generated by second transistor T1 and delivered through the fifth transistor T6. 

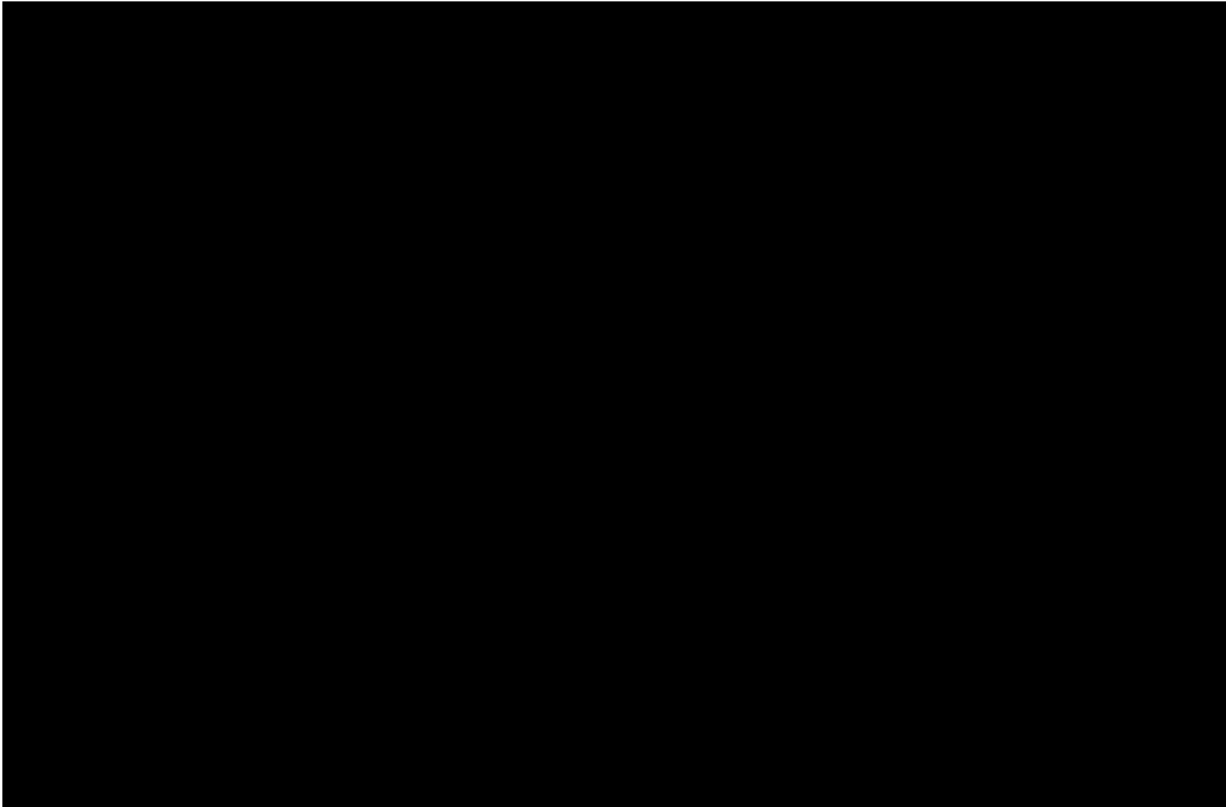
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[g] an electroluminescent element for emitting light corresponding to the driving current delivered through the fifth transistor, (cont'd)	As is reflected in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] transistors T5 and T6 turn on, and current (red line) can flow from [REDACTED] through transistors T5-T1-T6 to the OLED. The voltage stored by capacitor [REDACTED] (see also claim element 7[d], above) is applied to the gate of second transistor T1, and this applied voltage determines the amount of driving current that flows through second transistor T1 to the OLED, which in turn determines the amount of light emitted by the OLED.

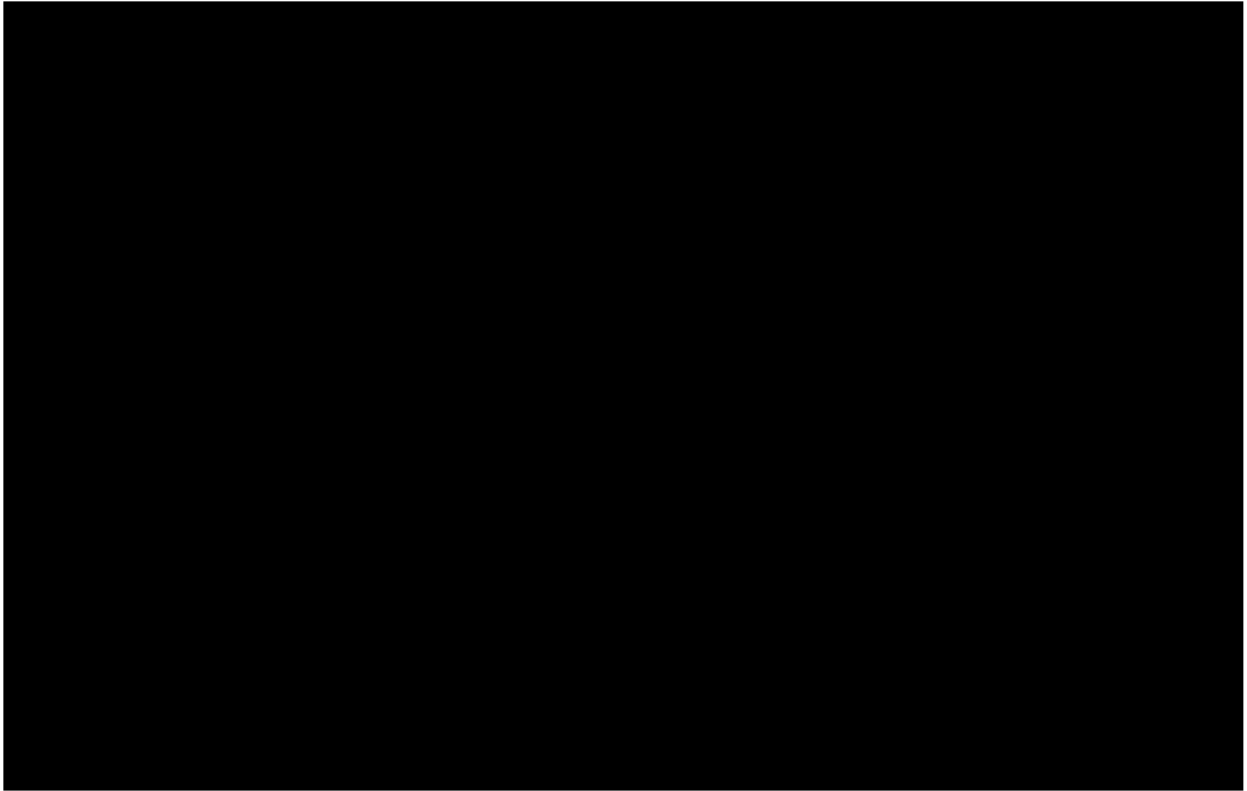
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
7[h] wherein the third transistor connects the second transistor in the form of a diode in response to the current scan signal so that the second transistor detects and compensates its threshold voltage deviation in itself.	In the pixel circuit of the [REDACTED] the third transistor connects the second transistor in the form of a diode in response to the current scan signal so that the second transistor detects and compensates its threshold voltage deviation in itself. For example, as shown in the [REDACTED] in response to a current scan signal (blue line) delivered on scan line [REDACTED] being active (low), the first transistor T2 delivers the data signal voltage (red line) present on data line [REDACTED] to the gate of the second transistor T1 through the third transistor T3. The third transistor T3 is connected between the drain and gate of second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] third transistor T3 connects the drain and gate of second transistor T1 together (red line), connecting second transistor T1 in the form of a diode, so that the second transistor T1 detects and compensates its threshold voltage deviation in itself. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
8. The pixel circuit in the organic light emitting device of claim 7, further comprising: a sixth initialization transistor for discharging the data signal voltage stored in the capacitor in response to a scan signal just before the current scan signal upon initialization.	The pixel circuit of the [REDACTED] has a sixth initialization transistor for discharging the data signal voltage stored in the capacitor in response to a scan signal just before the current scan signal upon initialization. As shown in the [REDACTED] the sixth transistor T4 is coupled between an initialization voltage line [REDACTED] and the capacitor [REDACTED]. The sixth transistor T4 turns on in response to an active (low) scan signal (blue line) on scan line [REDACTED] that is a scan signal just before the current scan signal on scan line [REDACTED]. The data signal voltage stored in the capacitor [REDACTED] is discharged (red line) through sixth transistor T4 to initialization voltage line [REDACTED]. 

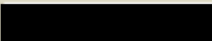
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
8. The pixel circuit in the organic light emitting device of claim 7, further comprising: a sixth initialization transistor for discharging the data signal voltage stored in the capacitor in response to a scan signal just before the current scan signal upon initialization. (<i>cont'd</i>)	As shown in the timing diagram below, the active (low) scan signal on scan line [REDACTED] is a scan signal just before the current scan signal on scan line [REDACTED]. As discussed previously, the sixth transistor T4 turns on in response to an active (low) scan signal is delivered on scan line [REDACTED] just before the current scan signal is delivered on scan line [REDACTED]. The data signal voltage stored in the capacitor [REDACTED] is discharged through sixth transistor T4 to initialization voltage line [REDACTED]. 

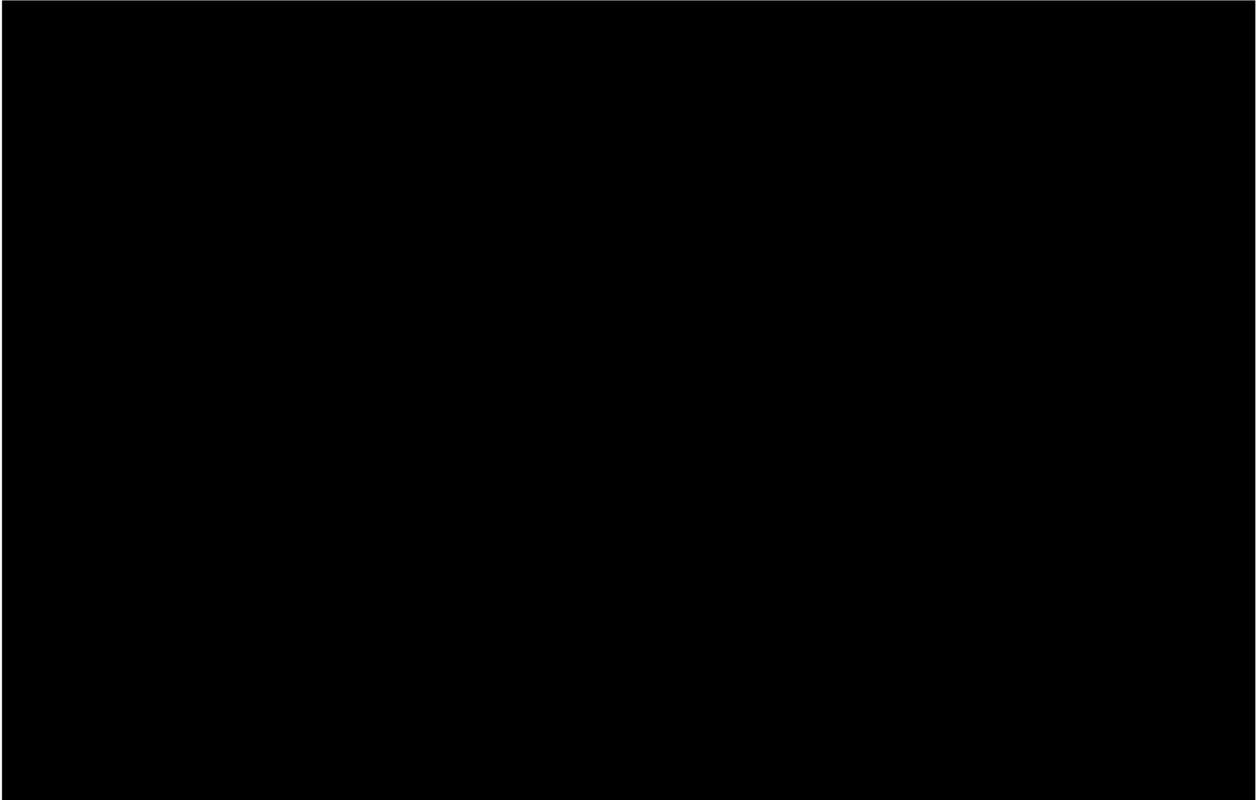
[REDACTED]

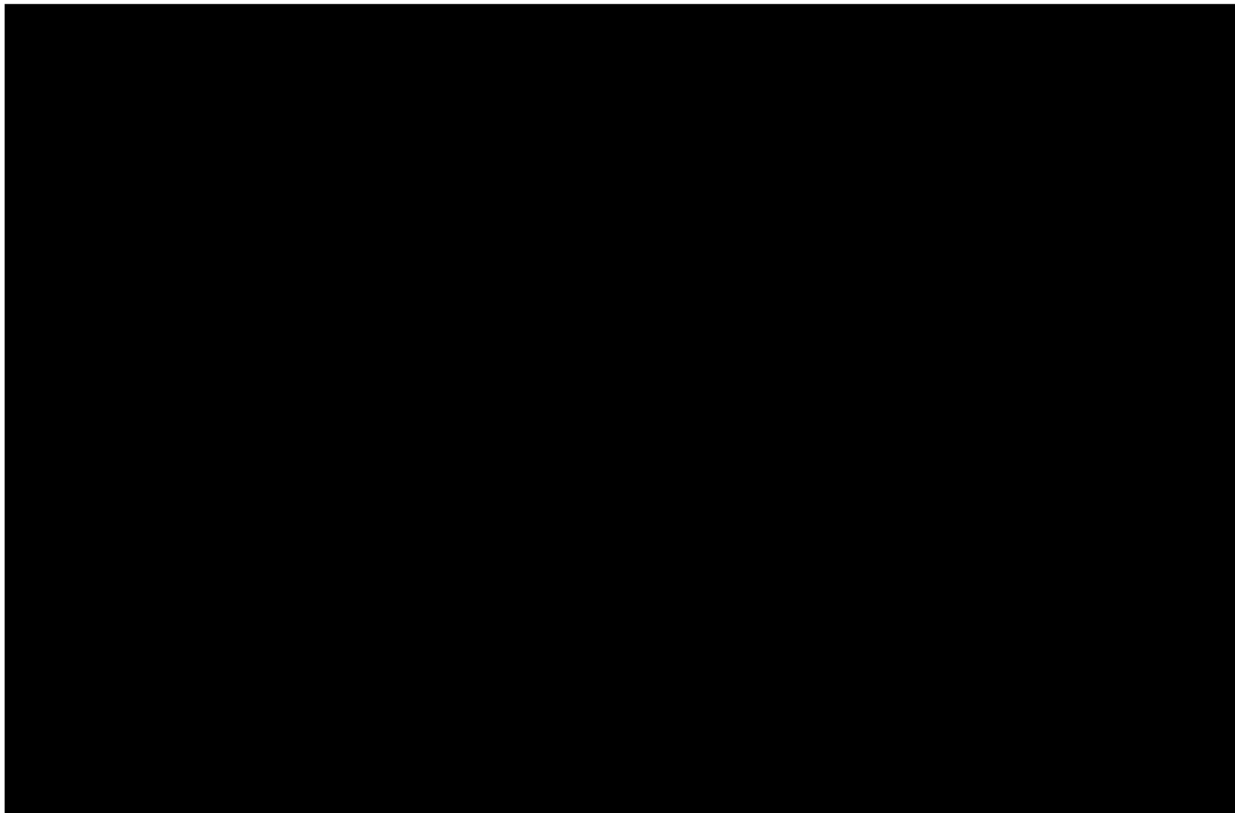
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
9. The pixel circuit in the organic light emitting device of claim 7, wherein the first transistor is composed of a PMOS transistor including a gate to which the current scan line signal is applied, a source to which the data signal voltage is applied, and a drain coupled to the second transistor.	The pixel circuit of the [REDACTED] has a first transistor composed of a PMOS transistor, including a gate to which the current scan line signal is applied, a source to which the data signal voltage is applied, and a drain coupled to the second transistor. As shown in the [REDACTED] the circuit symbol for the first transistor T2 indicates that it is a PMOS transistor. As shown in the [REDACTED] the first transistor T2 includes a gate to which the current scan line signal from scan line [REDACTED] is applied, a source to which the data signal voltage from data line [REDACTED] is applied, and a drain coupled to the second transistor T1. 

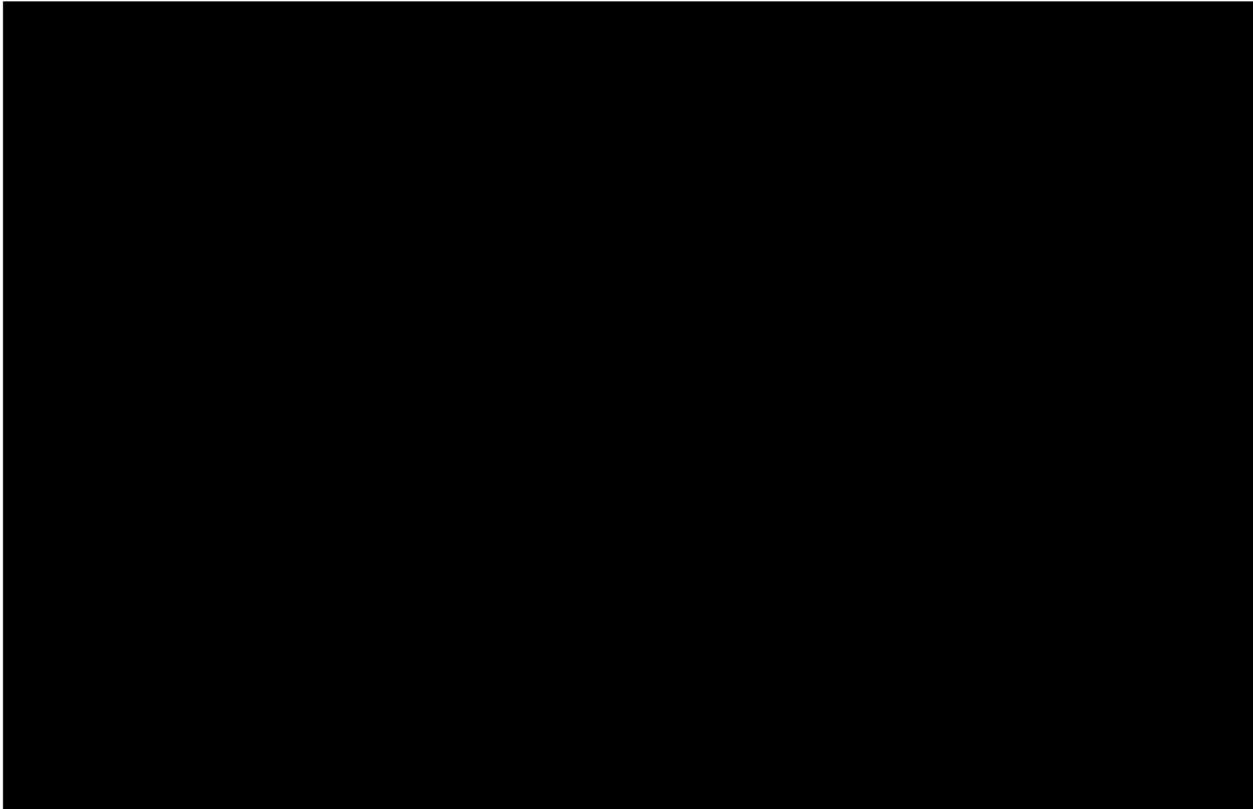
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
10. The pixel circuit in the organic light emitting device of claim 7, wherein the second transistor is composed of a PMOS transistor including a gate coupled to one terminal of the capacitor, a source coupled to the first transistor, and a drain coupled to the electroluminescent element.	The pixel circuit of the [REDACTED] has a second transistor composed of a PMOS transistor, including a gate coupled to one terminal of the capacitor, a source coupled to the first transistor, and a drain coupled to the electroluminescent element. [REDACTED] the circuit symbol for the second transistor T1 indicates that it is a PMOS transistor. [REDACTED] the second transistor T1 includes a gate coupled to one terminal of the capacitor [REDACTED] a source coupled to the first transistor T2, and a drain coupled to the electroluminescent element through fifth transistor T6. 

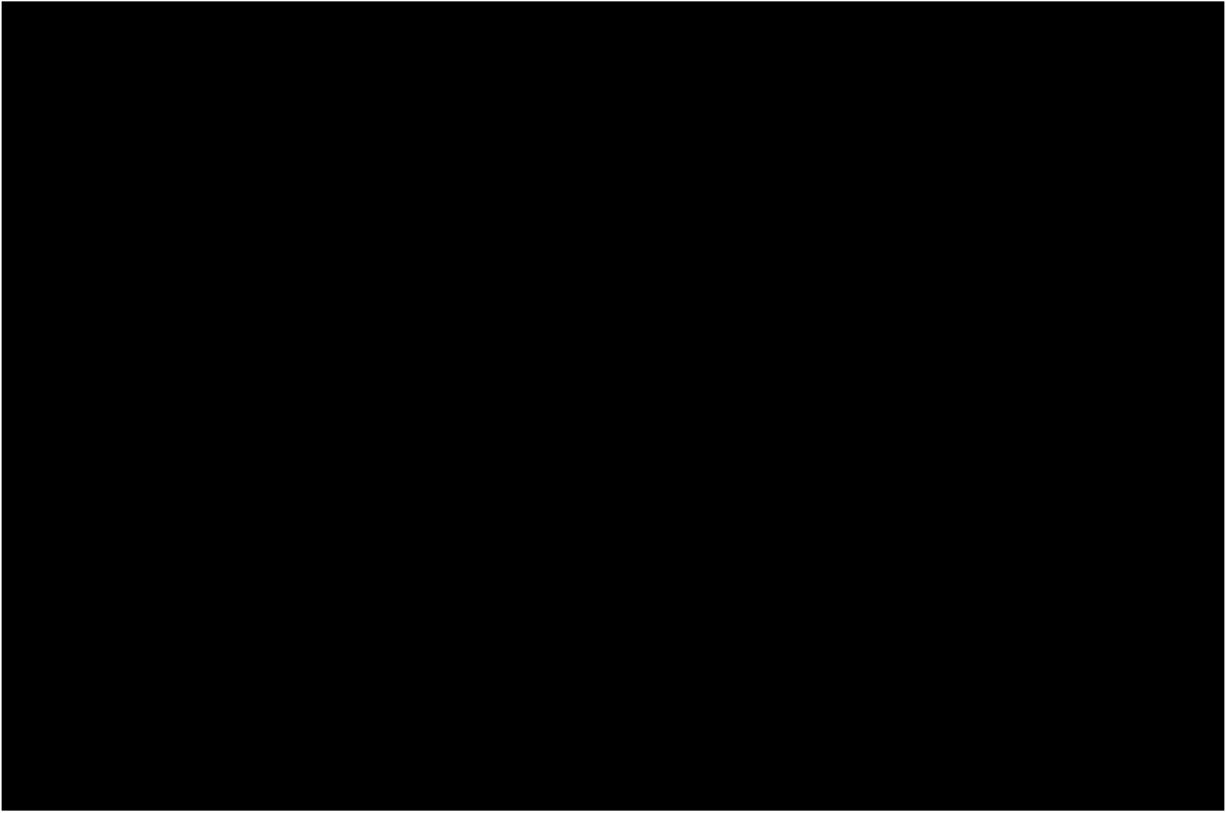


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
11. The pixel circuit in the organic light emitting device of claim 10, wherein the third transistor is composed of a PMOS transistor including a gate to which the current scan signal is applied, and a drain and a source which are coupled to the gate and the drain of the second transistor, respectively, so that the third transistor connects the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor.	The pixel circuit of the  has a third transistor composed of a PMOS transistor, including a gate, to which the current scan signal is applied, and a drain and a source that are coupled to the gate and the drain of the second transistor, respectively, so that the third transistor connects the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor. As shown in the  the circuit symbol for the third transistor T3 indicates that it is a PMOS transistor. As shown in the  the third transistor T3 includes a gate to which the current scan signal delivered on scan line  is applied, a drain coupled to the gate of the second transistor T1, and source coupled to the drain of second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line  third transistor T3 connects the drain and gate of second transistor T1 together (red line), connecting second transistor T1 in the form of a diode to self-compensate a threshold voltage of second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
12. The pixel circuit in the organic light emitting device of claim 7, further comprising: a voltage source for providing the data signal voltage through the first transistor for the second transistor.	In the pixel circuit of the [REDACTED] a voltage source for providing the data signal voltage through the first transistor for the second transistor is shown. As shown in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] the first transistor T2 turns on and provides the data signal voltage (red line) from the data line [REDACTED] to the second transistor T1. 

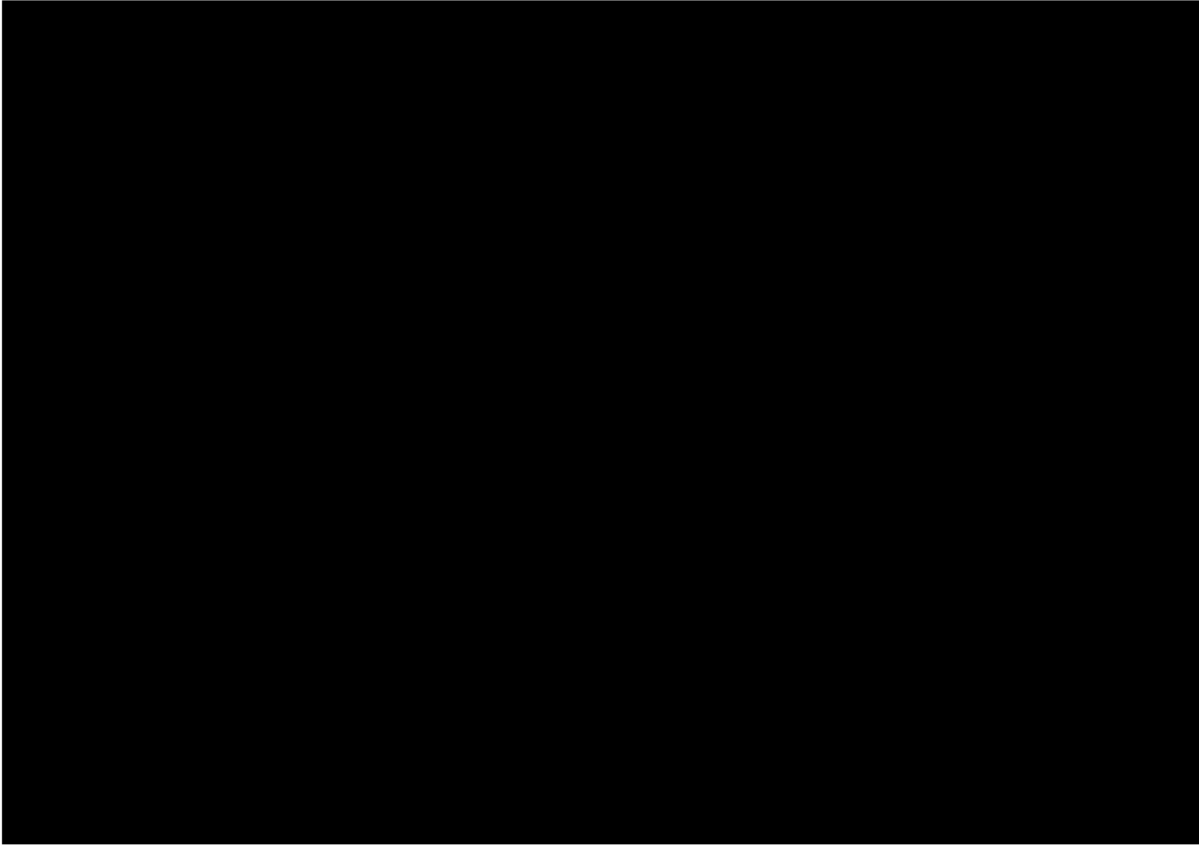
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
13[a] The pixel circuit in the organic light emitting device of claim 7, wherein the fourth transistor is composed of a PMOS transistor including a gate to which the current light-emitting signal is applied, a source to which a power supply voltage is applied, and a drain coupled to the second transistor; and	The pixel circuit of the [REDACTED] has a fourth transistor composed of a PMOS transistor, including a gate to which the current light-emitting signal is applied, a source to which a power supply voltage is applied, and a drain coupled to the second transistor. As shown in the [REDACTED] the circuit symbol for the fourth transistor T5 indicates that it is a PMOS transistor. As shown in the [REDACTED] the fourth transistor T5 includes a gate to which the current light-emitting signal is applied via emission line [REDACTED] a source coupled to the power supply voltage [REDACTED] and a drain coupled to the second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
13[b] the fifth transistor is composed of a PMOS transistor including a gate to which the current light-emitting signal is applied, a source coupled to the second transistor, and a drain coupled to the electroluminescent element.	The pixel circuit of the [REDACTED] has a fifth transistor composed of a PMOS transistor, including a gate to which the current light-emitting signal is applied, a source coupled to the second transistor, and a drain coupled to the electroluminescent element. As shown in the [REDACTED] the circuit symbol for the fifth transistor T6 indicates that it is a PMOS transistor. As shown in the [REDACTED] the fifth transistor T6 includes a gate to which the current light-emitting signal is applied via emission line [REDACTED] a source coupled to the drain of T1, and a drain coupled to the electroluminescent element (OLED). 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[preamble] A pixel circuit in an organic light emitting device, comprising:	The [REDACTED] includes a pixel circuit in an organic light-emitting device. For example, the [REDACTED] below of the [REDACTED] depicts the transistors T1–T7, the capacitor [REDACTED] and the OLED element. 

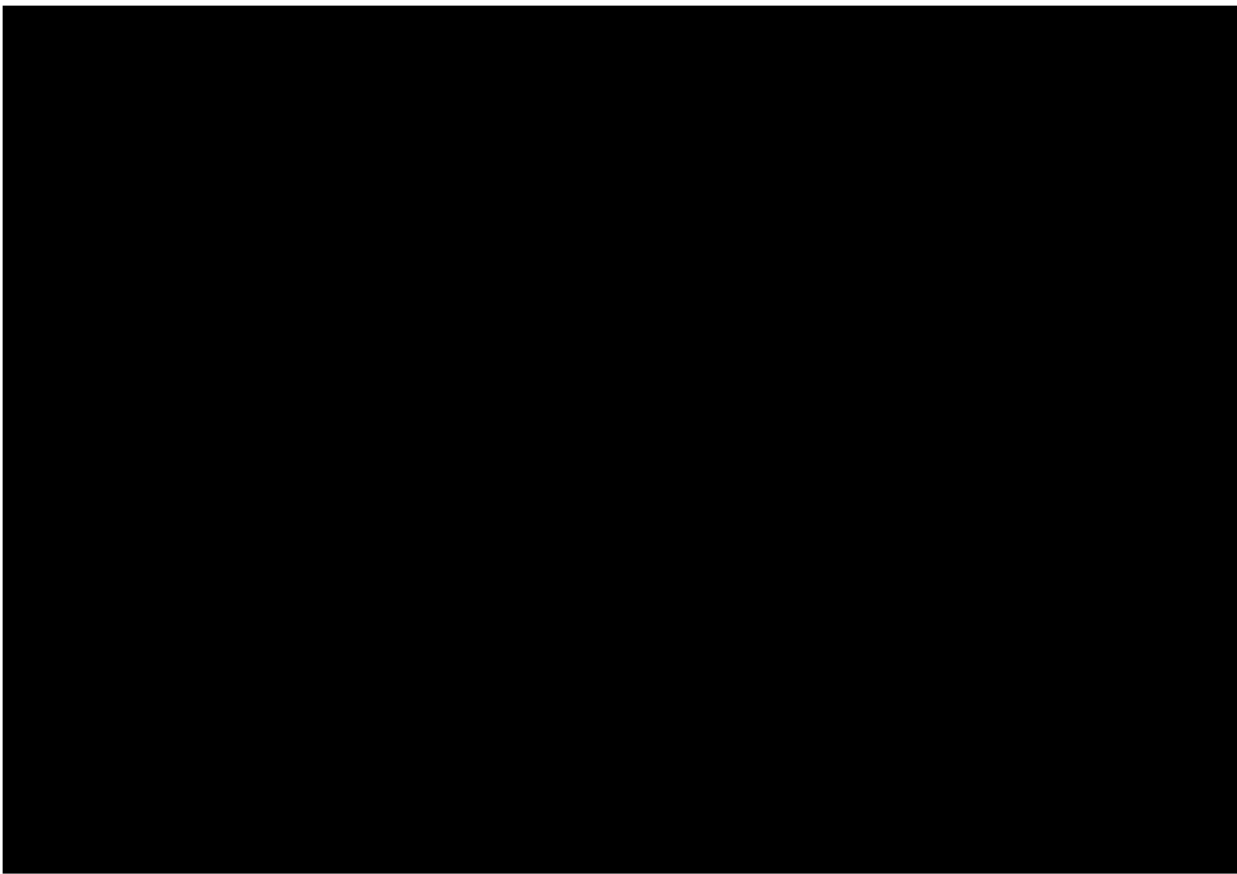


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[preamble] A pixel circuit in an organic light emitting device, comprising: <i>(cont'd)</i>	Ex. 2020 (Galaxy S21 Teardown Photos) at 2

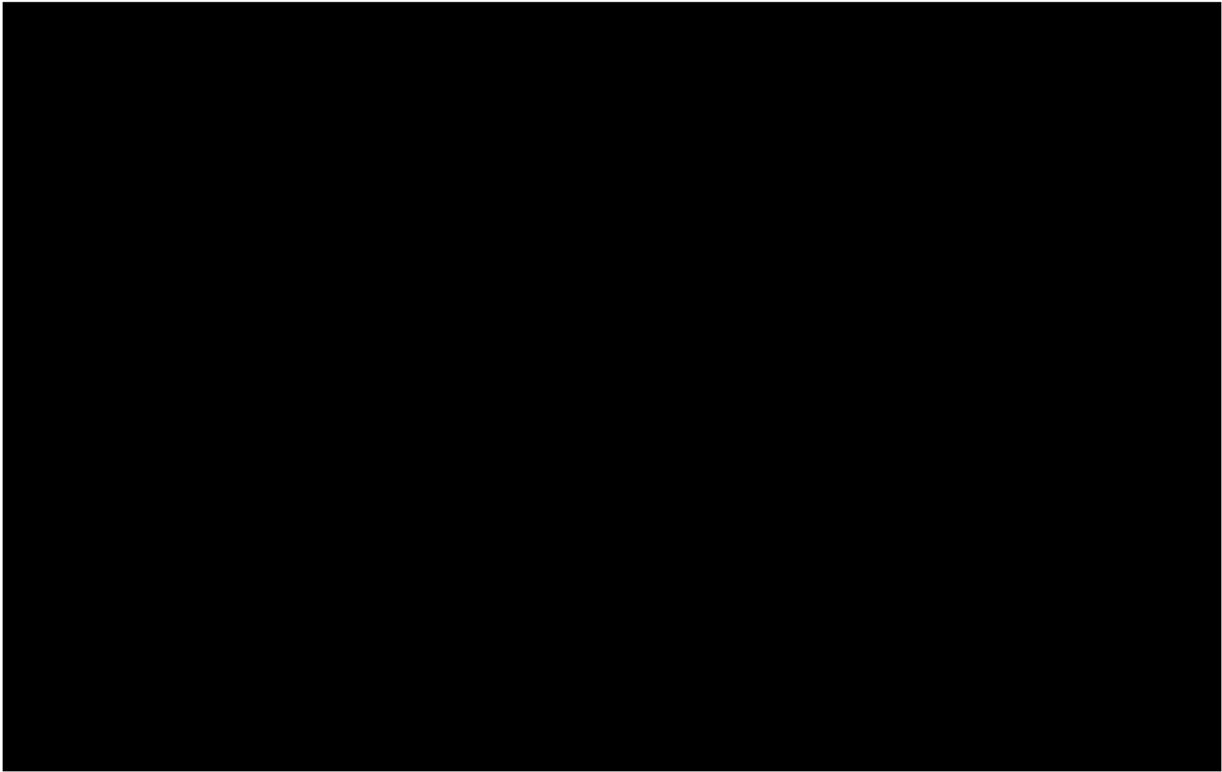
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[a] an electroluminescent element for emitting light in response to an applied driving current;	The pixel circuit of the [REDACTED] has an electroluminescent element for emitting light in response to an applied driving current. [REDACTED] the driving current flows from a power supply voltage [REDACTED] through a transistors T5, T1, and T6, respectively, to the electroluminescent element (OLED) to emit light. The light emitted by the OLED corresponds to the driving current generated through the second transistor T1. 

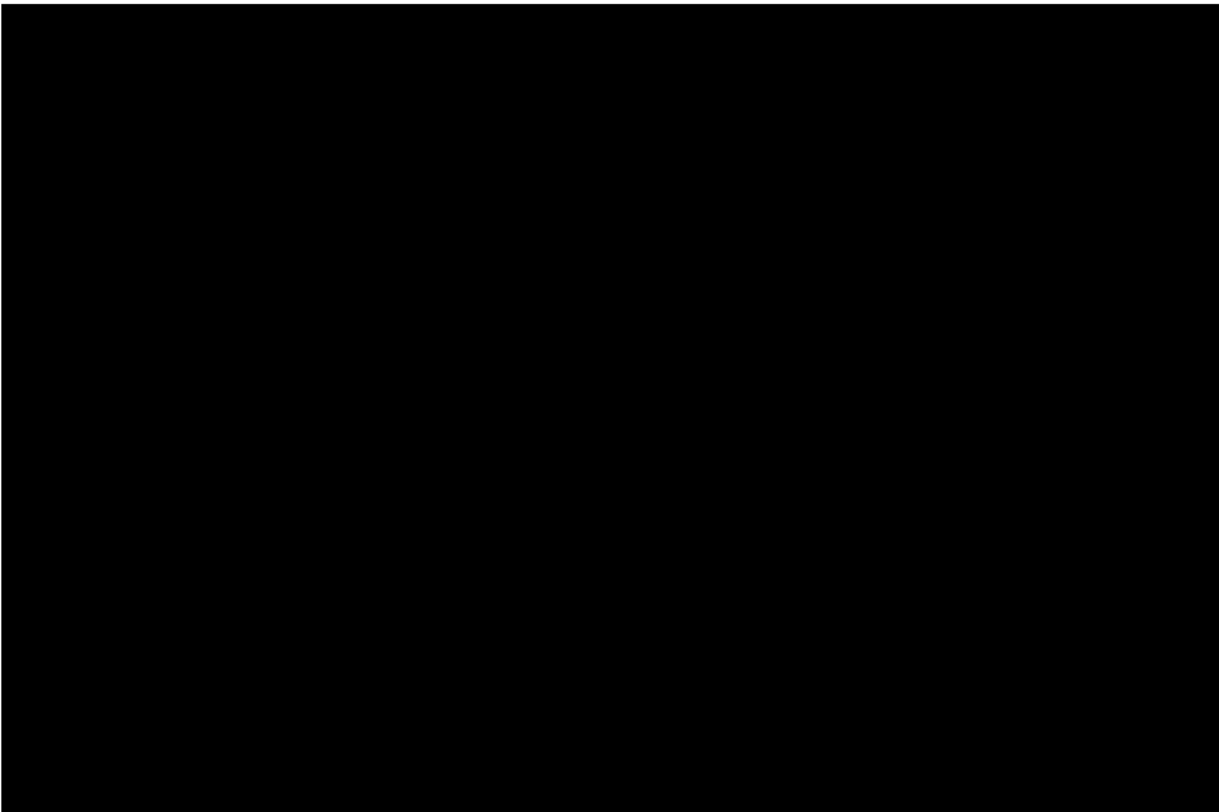
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[a] an electroluminescent element for emitting light in response to an applied driving current; (<i>cont'd</i>)	As reflected in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] transistors T5 and T6 turn on and current (red line) flows from [REDACTED] through transistor T1 to the OLED. The voltage stored by the capacitor [REDACTED] (see also claim element 14[e], below) is applied to the gate of transistor T1. As shown in the [REDACTED] the driving current flows from a power supply voltage [REDACTED] through transistor T5, through transistor T1, and through transistor T6 to the OLED. The amount of light emitted from the OLED corresponds to the driving current generated by transistor T1.

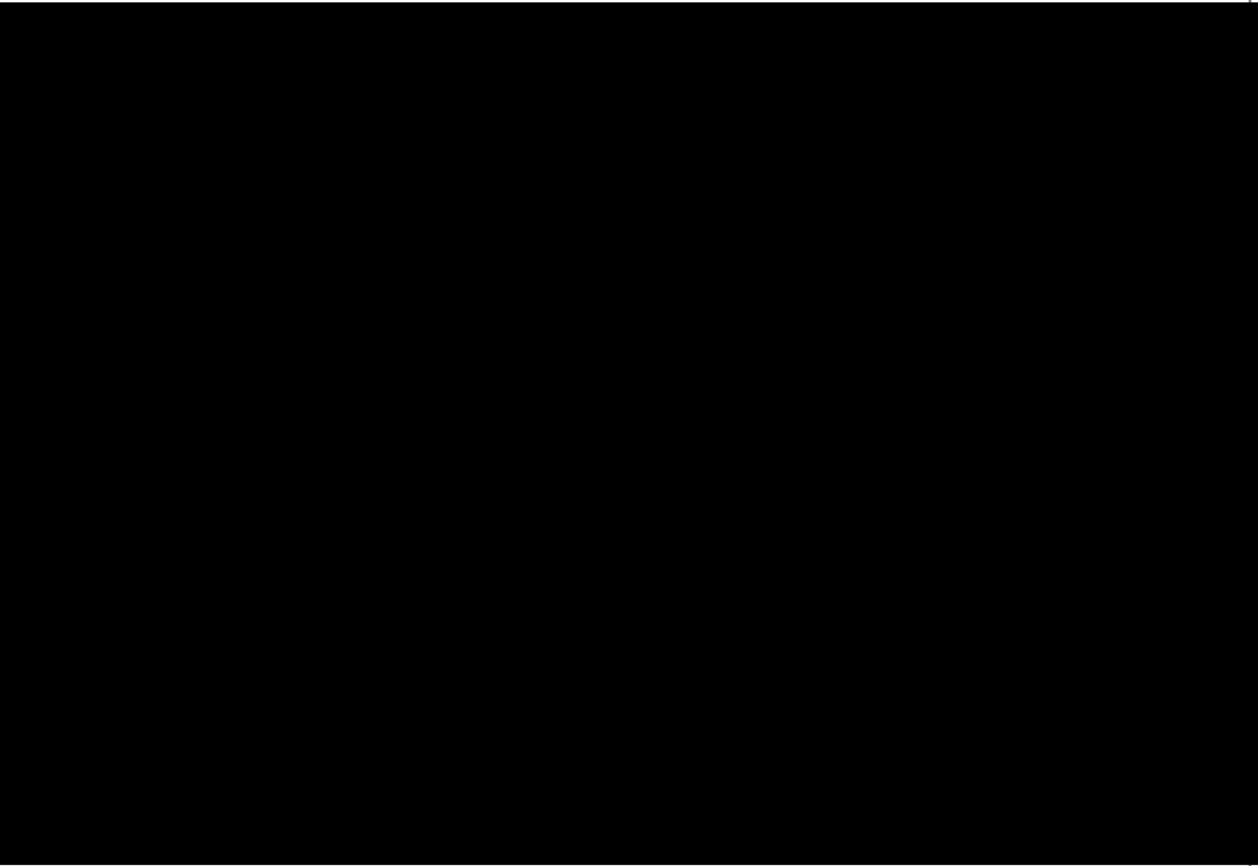
[REDACTED]

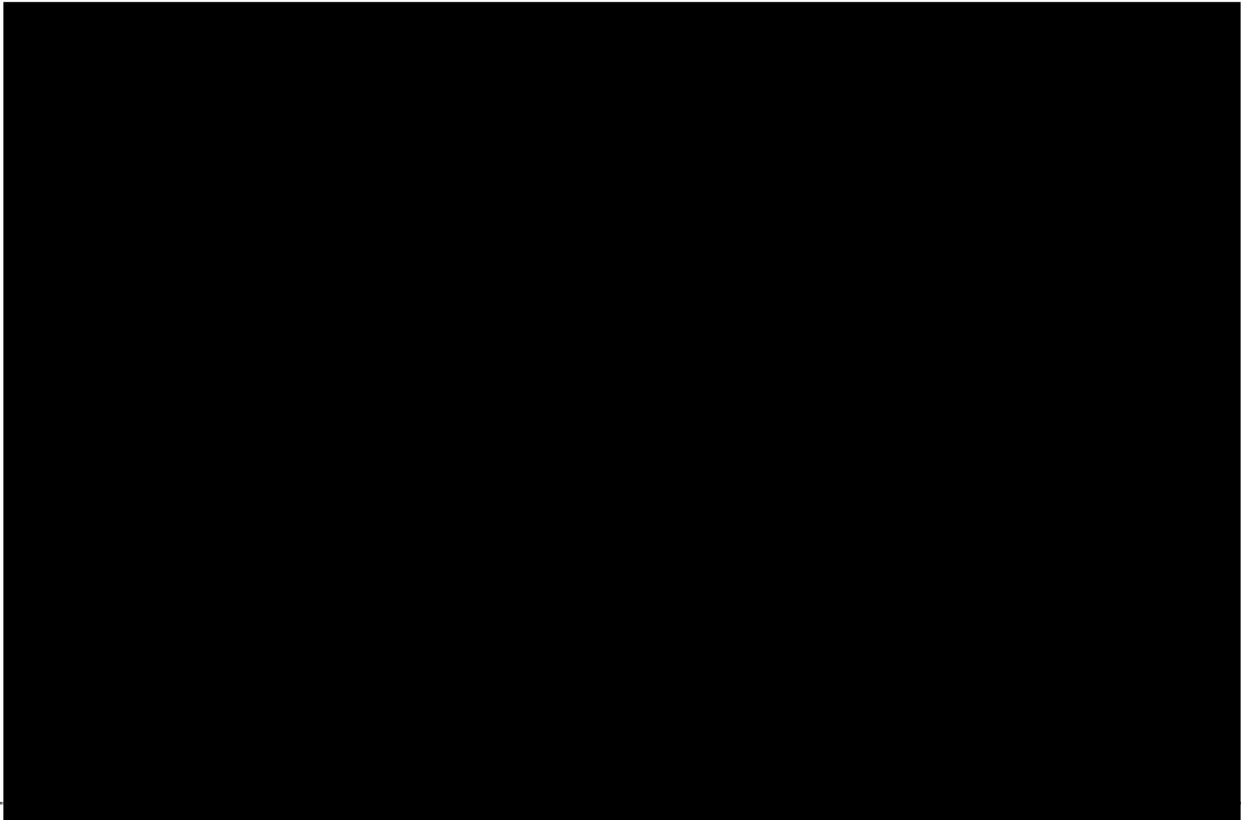
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[b] a first transistor for delivering a data signal voltage in response to a current scan line signal;	The pixel circuit of the [REDACTED] has a first transistor for delivering a data signal voltage in response to a current scan line signal. [REDACTED] the first transistor T2 is coupled to a data line [REDACTED] for delivering a data signal voltage. The gate of first transistor T2 is coupled to a scan line [REDACTED] that delivers a current scan line signal to the gate of first transistor T2. In response to the current scan line signal being active (low), first transistor T2 delivers a data signal voltage from data line [REDACTED] 

[REDACTED]

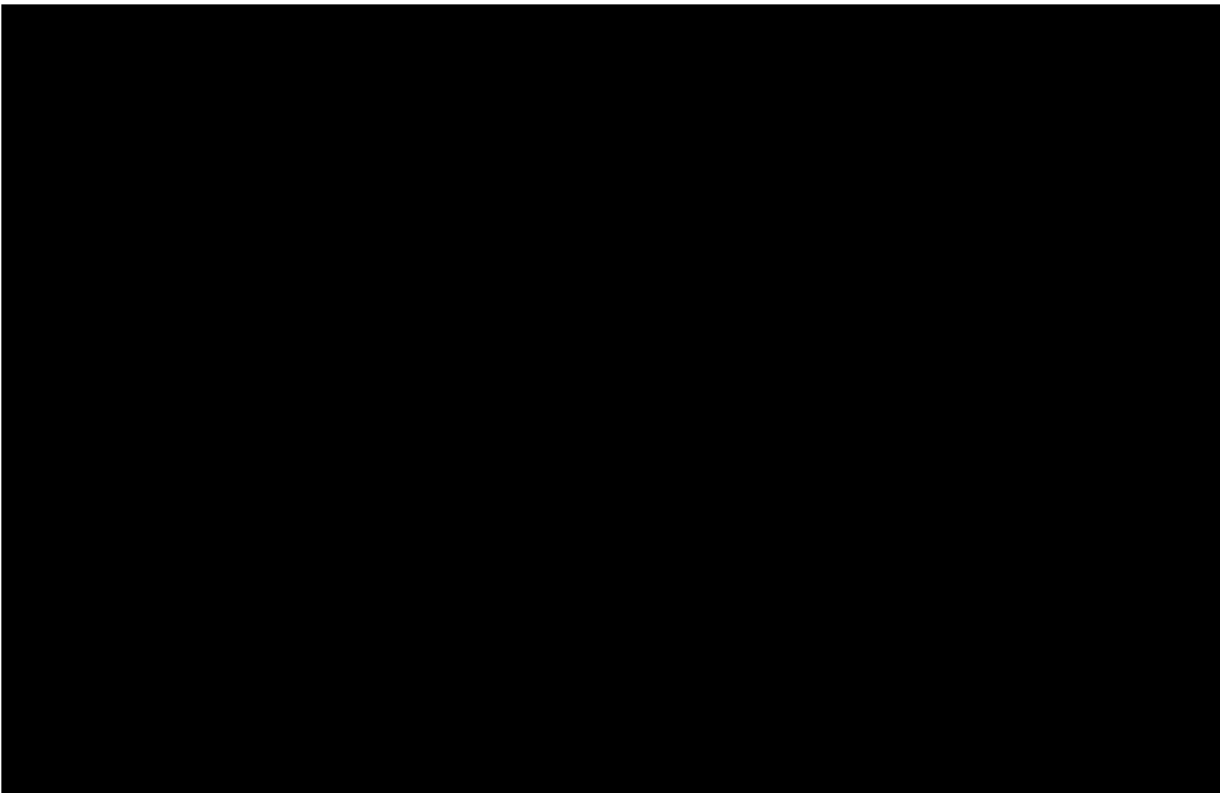
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[b] a first transistor for delivering a data signal voltage in response to a current scan line signal; (<i>cont'd</i>)	As further shown in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) present on data line [REDACTED]. The annotated [REDACTED] below depicts an exemplary voltage path from data line [REDACTED] through transistors T2-T1-T3 to the gate of transistor T1. 

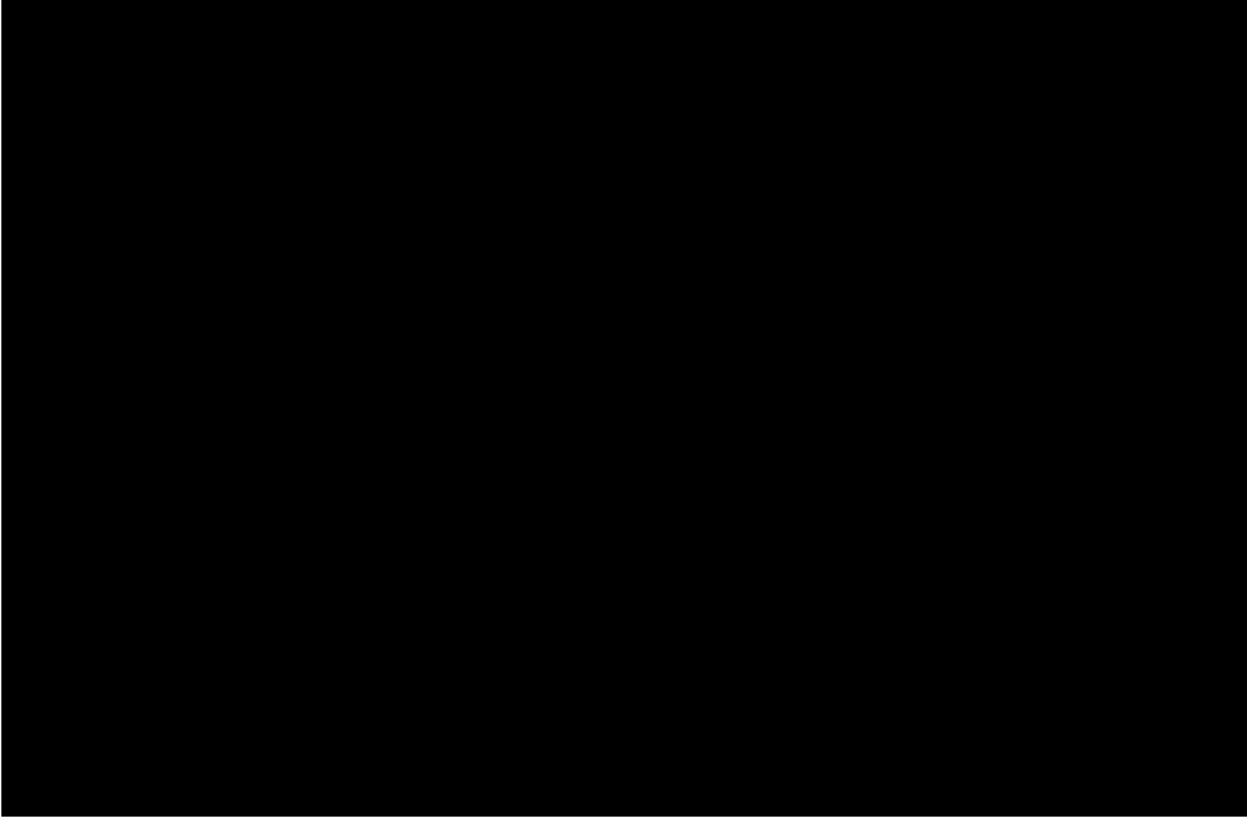
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[c] a second transistor for generating a driving current to drive the electroluminescent element in response to the data signal voltage;	The pixel circuit of the [REDACTED] has a second transistor for generating a driving current to drive the electroluminescent element in response to the data signal voltage. [REDACTED] [REDACTED] the second transistor T1 is coupled to a power supply voltage [REDACTED]. As described for claim element 1[a] above, the first transistor T2 delivers a data signal voltage in response to an active (low) current scan line signal that is delivered on scan line [REDACTED]. The data signal voltage is stored on the capacitor [REDACTED]. The second transistor T1 will generate a driving current in response to the voltage stored on the capacitor [REDACTED] and the current will be sourced from [REDACTED]. 

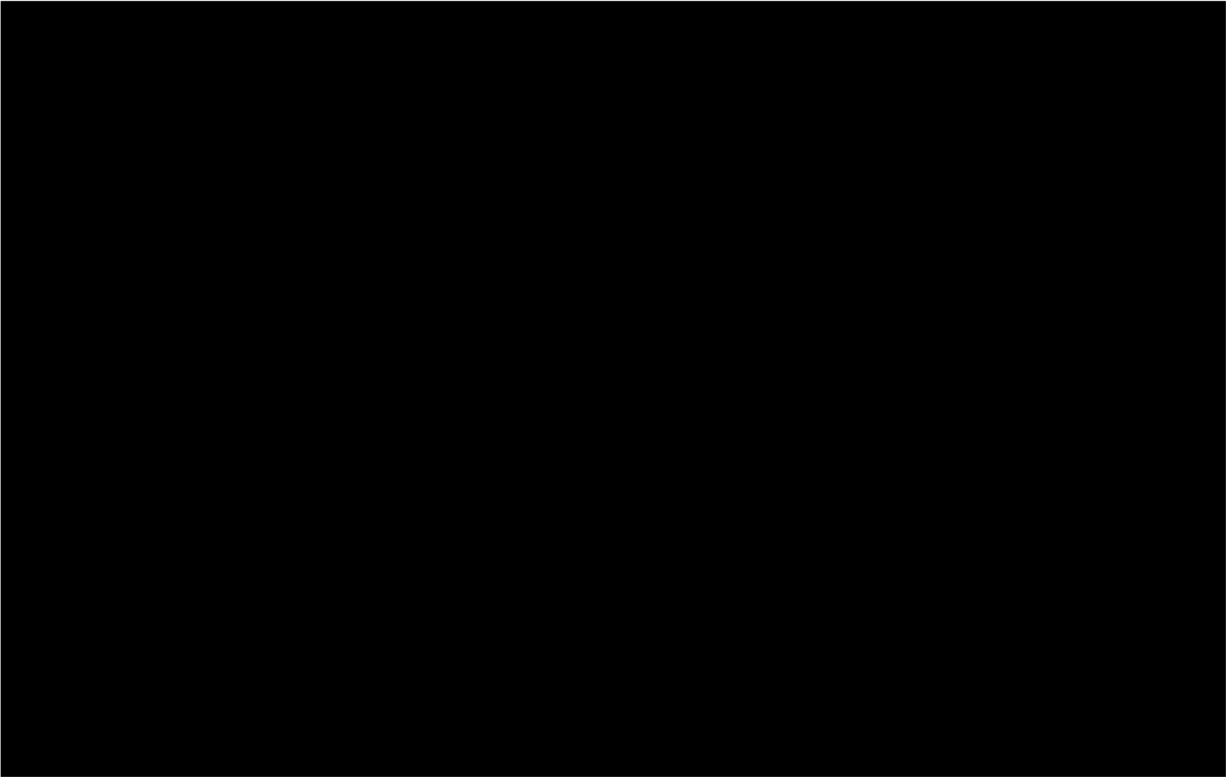
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[c] a second transistor for generating a driving current to drive the electroluminescent element in response to the data signal voltage; (<i>cont'd</i>)	For example, as shown in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] transistors T5 and T6 turn on, and a driving current (red line) flows from [REDACTED] through second transistor T1 to the OLED. The amount of current that flows through second transistor T1 to the OLED is dependent upon the voltage that was stored on the capacitor [REDACTED] which is based on the data signal voltage delivered previously through first transistor T2 (see <i>also</i> claim element 14[b], above). 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[d] a third transistor for connecting the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor;	The pixel circuit of the [REDACTED] has a third transistor for connecting the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor. As shown in the [REDACTED] a third transistor T3 connects the gate and drain of the second transistor T1, connecting the second transistor T1 in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor T1. Third transistor T3 is connected between the gate and the drain of second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] third transistor T3 connects the drain and gate of second transistor T1 together (red line), connecting second transistor T1 in the form of a diode to self-compensate a threshold voltage of second transistor T1. 

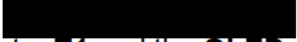
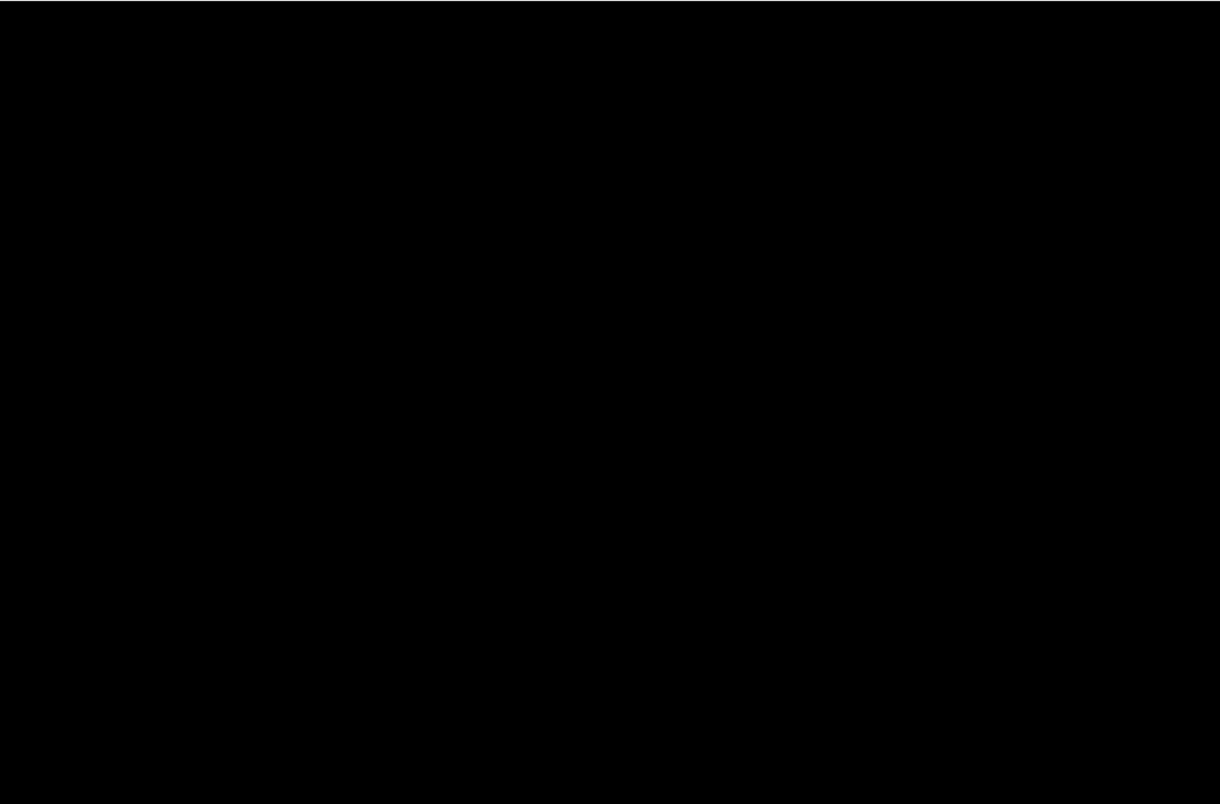
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[d] a third transistor for connecting the second transistor in the form of a diode in response to the current scan signal to self-compensate a threshold voltage of the second transistor; (<i>cont'd</i>)	As reflected in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] transistors T2 and T3 turn on and a data signal voltage (red line) on data line [REDACTED] flows through transistors T2-T1-T3 and is stored on the capacitor [REDACTED]. This arrangement allows for the detection and self-compensation of the threshold voltage deviation in second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[e] a capacitor for storing the data signal voltage delivered to the second transistor;	The pixel circuit of the [REDACTED] has a capacitor for storing the data signal voltage delivered to the second transistor. As shown in the [REDACTED] the capacitor [REDACTED] has an upper plate and a lower plate. The capacitor [REDACTED] stores the data signal voltage delivered to the second transistor T1. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) on data line [REDACTED] to second transistor T1 and to capacitor [REDACTED] (see <i>a/so</i> claim elements 14[b], 14[c], above). 

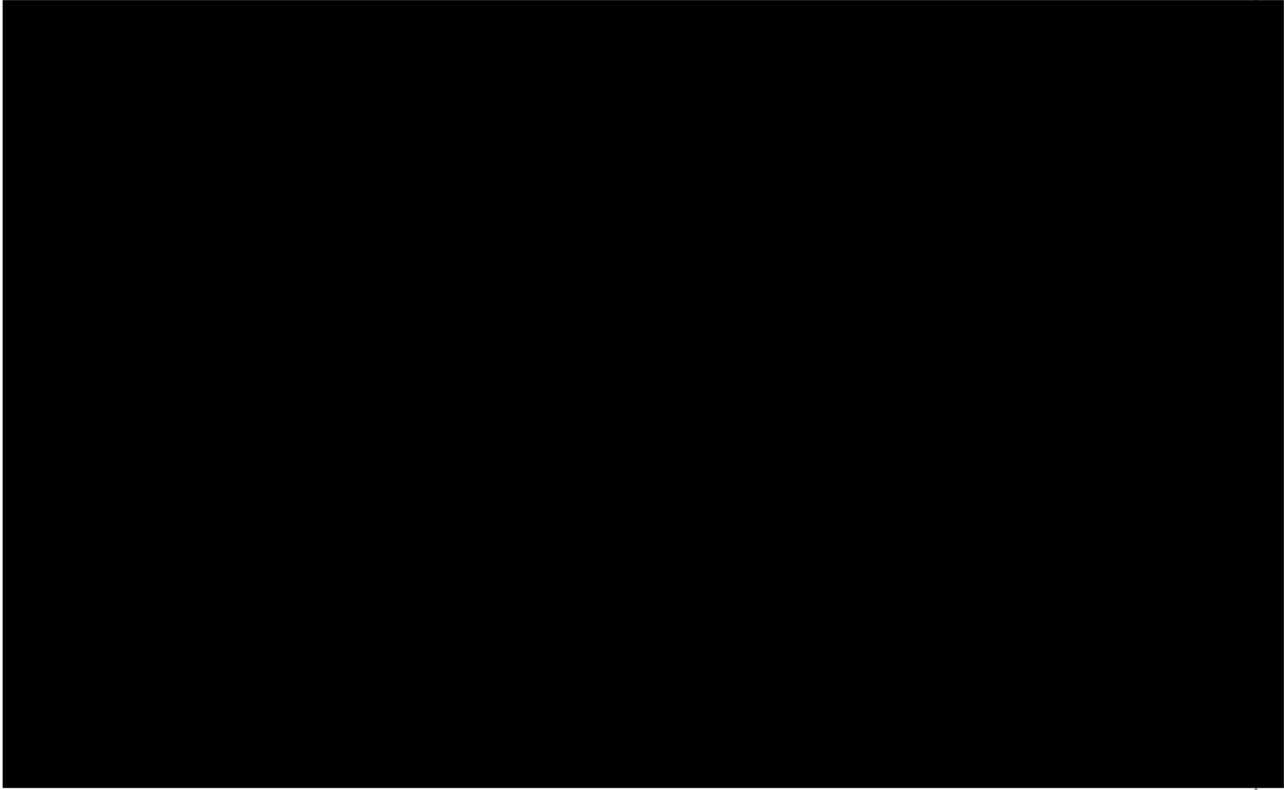
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[7] a fourth transistor for delivering a power supply voltage to the second transistor in response to a current light-emitting signal; and	The pixel circuit of the [REDACTED] has a fourth transistor for delivering a power supply voltage to the second transistor in response to a current light-emitting signal. [REDACTED] the fourth transistor T5 is coupled to a power supply voltage [REDACTED] and second transistor T1. In response to an active (low) current light-emitting signal delivered on emission line [REDACTED] fourth transistor T5 delivers a power supply voltage from [REDACTED] to second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[7] a fourth transistor for delivering a power supply voltage to the second transistor in response to a current light-emitting signal; and (cont'd)	As reflected in the [REDACTED] in response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] fourth transistor T5 turns on and provides a power supply voltage [REDACTED] (red line) to second transistor T1. 

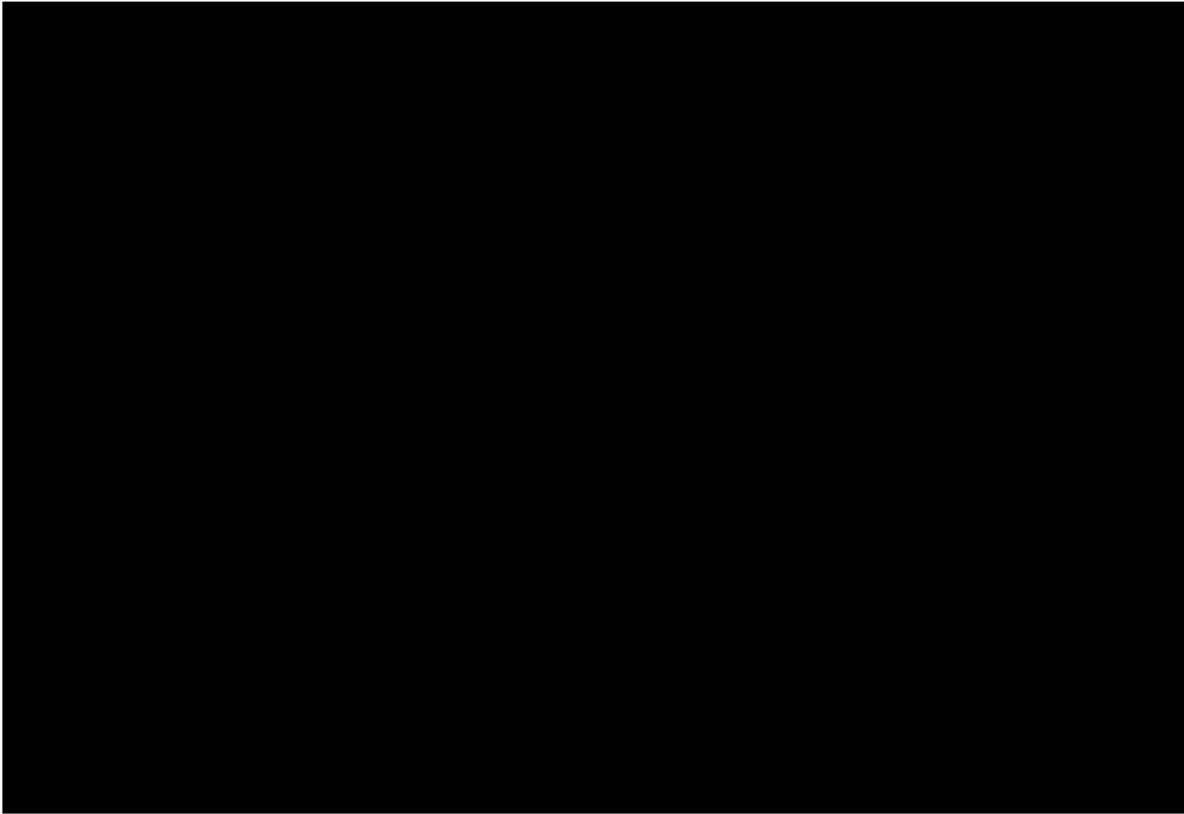


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
14[g] a fifth transistor for providing the driving current, provided from the second transistor, for the electroluminescent element in response to the current light-emitting signal.	The pixel circuit of the  has a fifth transistor for providing the driving current, provided from the second transistor, for the electroluminescent element in response to the current light-emitting signal.  the fifth transistor T6 is coupled to the second transistor T1 and to an electroluminescent element (OLED).  fifth transistor T6 is in series between second transistor T1 and the OLED. In response to an active (low) current light-emitting signal delivered on emission line  fifth transistor T6 turns on and provides driving current that flows through second transistor T1 to the OLED. 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
14[g] a fifth transistor for providing the driving current, provided from the second transistor, for the electroluminescent element in response to the current light-emitting signal. (<i>cont'd</i>)	As shown in the [REDACTED] fifth transistor T6 is coupled in series between second transistor T1 and the OLED. In response to an active (low) current light-emitting signal (blue line) delivered on emission line [REDACTED] fifth transistor T6 turns on, and the driving current flows (red line) from second transistor T1 through fifth transistor T6 to the OLED. 

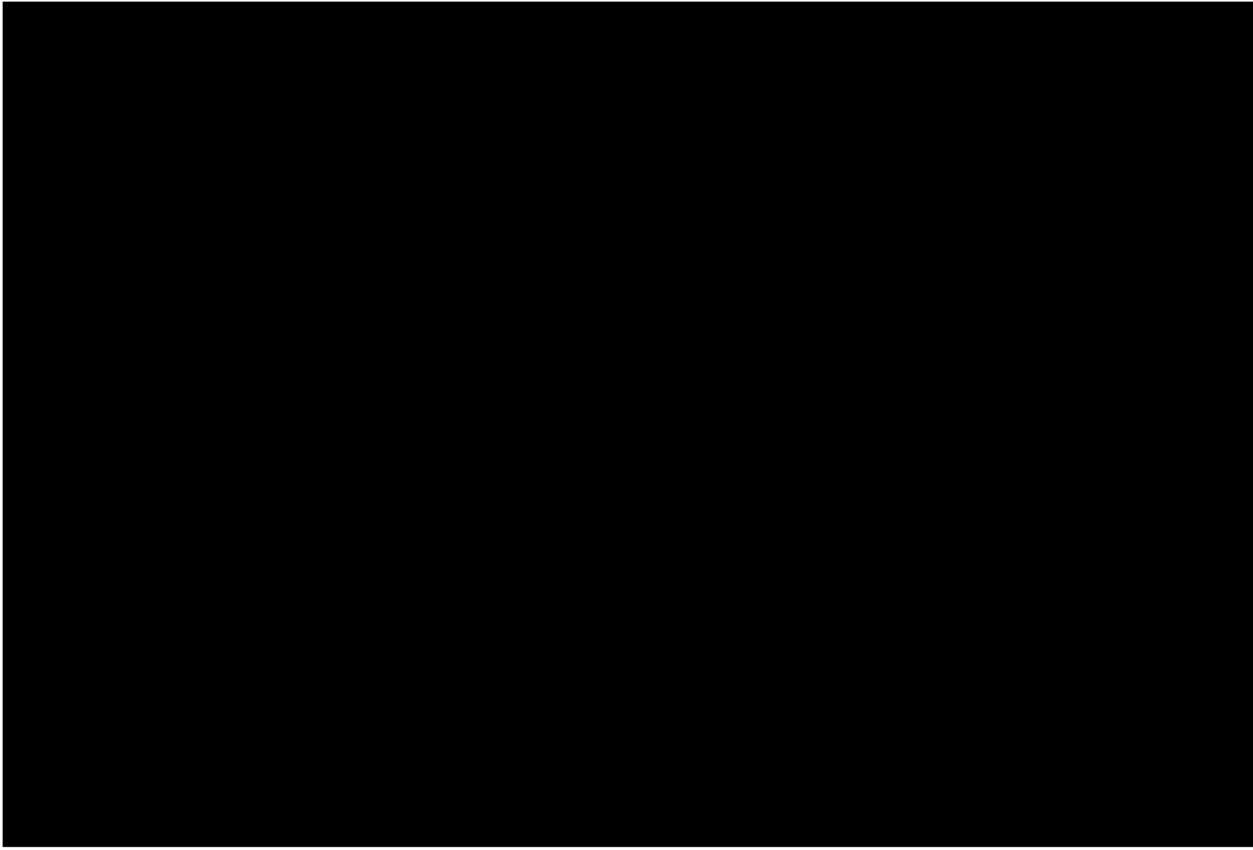
[REDACTED]

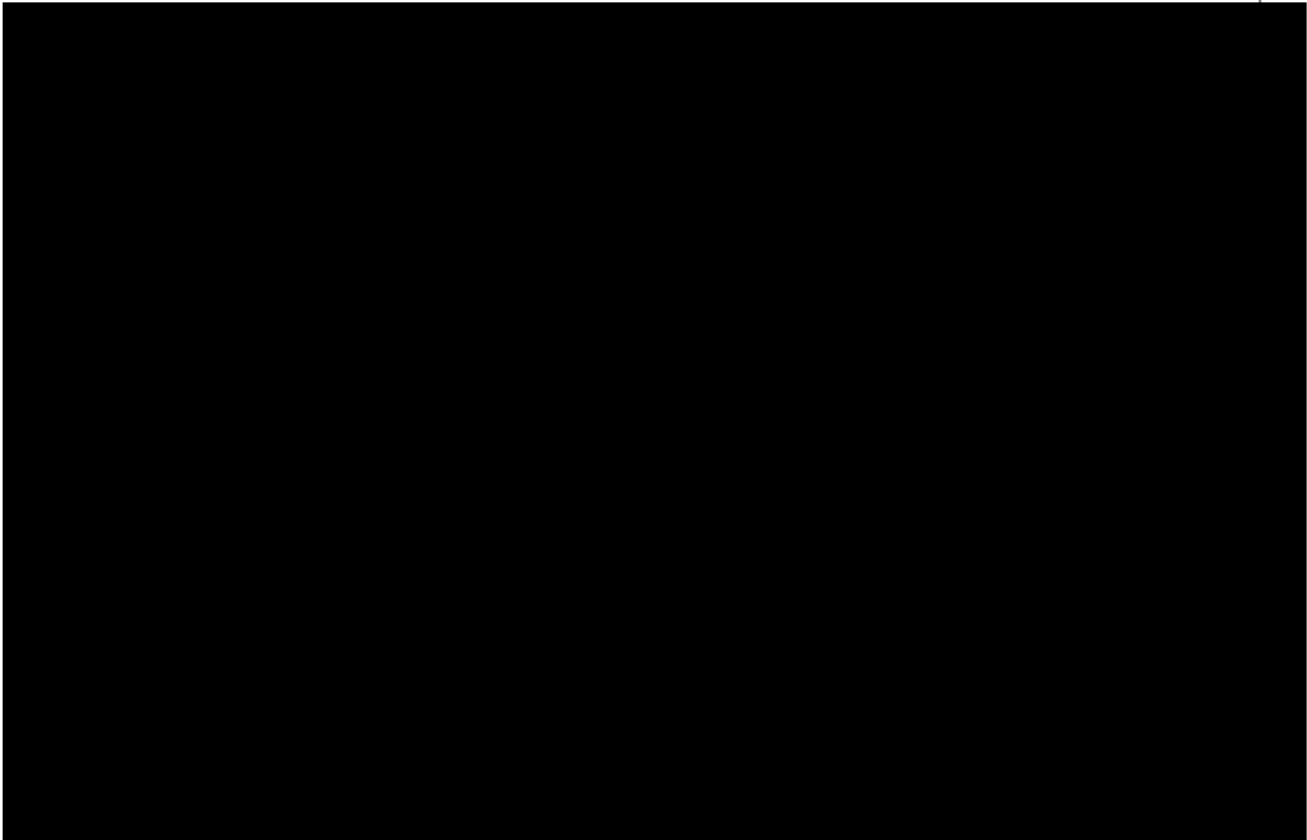
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[preamble] A pixel circuit in an organic light emitting device, comprising:	The [REDACTED] includes a pixel circuit in an organic light-emitting device. For example, the [REDACTED] below of the [REDACTED] depicts the transistors T1–T7, the capacitor [REDACTED] and the OLED element. 



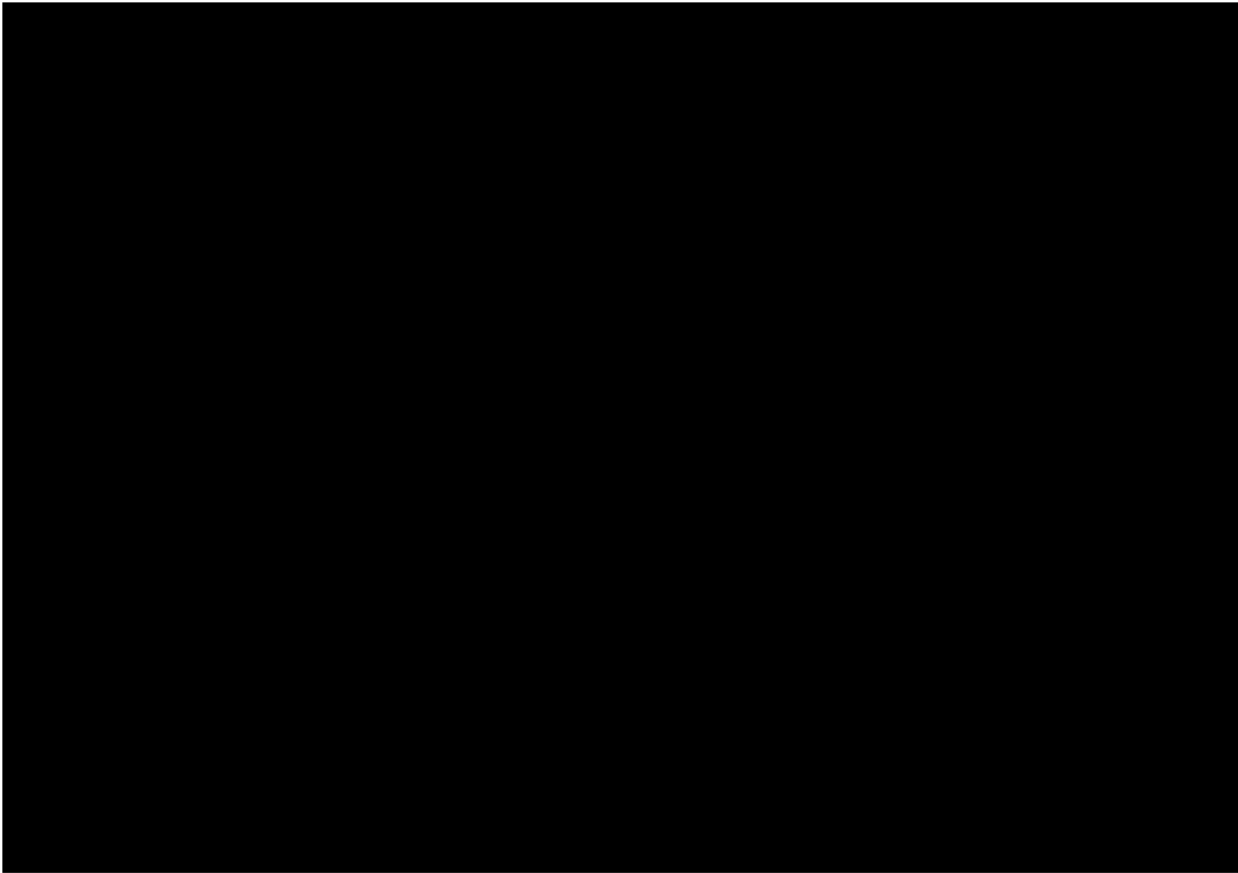
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[preamble] A pixel circuit in an organic light emitting device, comprising: <i>(cont'd)</i>	 Ex. 2020 (Galaxy S21 Teardown Photos) at 2

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[a] a first transistor including a gate to which a current scan signal is applied, and a source to which a data signal voltage is applied;	The pixel circuit of the [REDACTED] has a first transistor including a gate to which a current scan signal is applied, and a source to which a data signal voltage is applied. [REDACTED] the first transistor T2 is coupled to a data line [REDACTED] for delivering a data signal voltage. The gate of first transistor T2 is coupled to a scan line [REDACTED] that delivers a current scan line signal to the gate of first transistor T2. A data signal voltage from data line [REDACTED] is applied to the source of first transistor T2. 

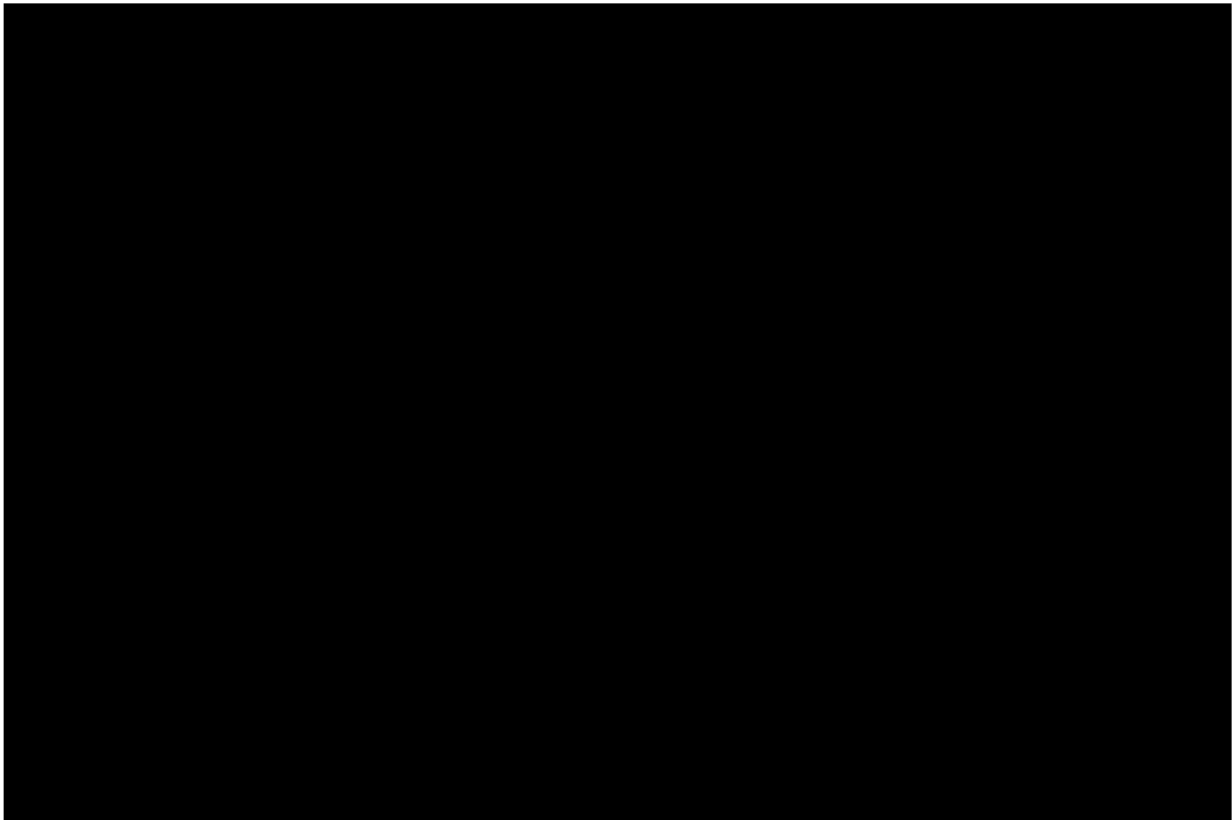
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[a] a first transistor including a gate to which a current scan signal is applied, and a source to which a data signal voltage is applied; (<i>cont'd</i>)	As reflected in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) present on data line [REDACTED]. The annotated [REDACTED] below depicts an exemplary voltage path from data line [REDACTED] through transistors T2-T1-T3 to the gate of transistor T1. 

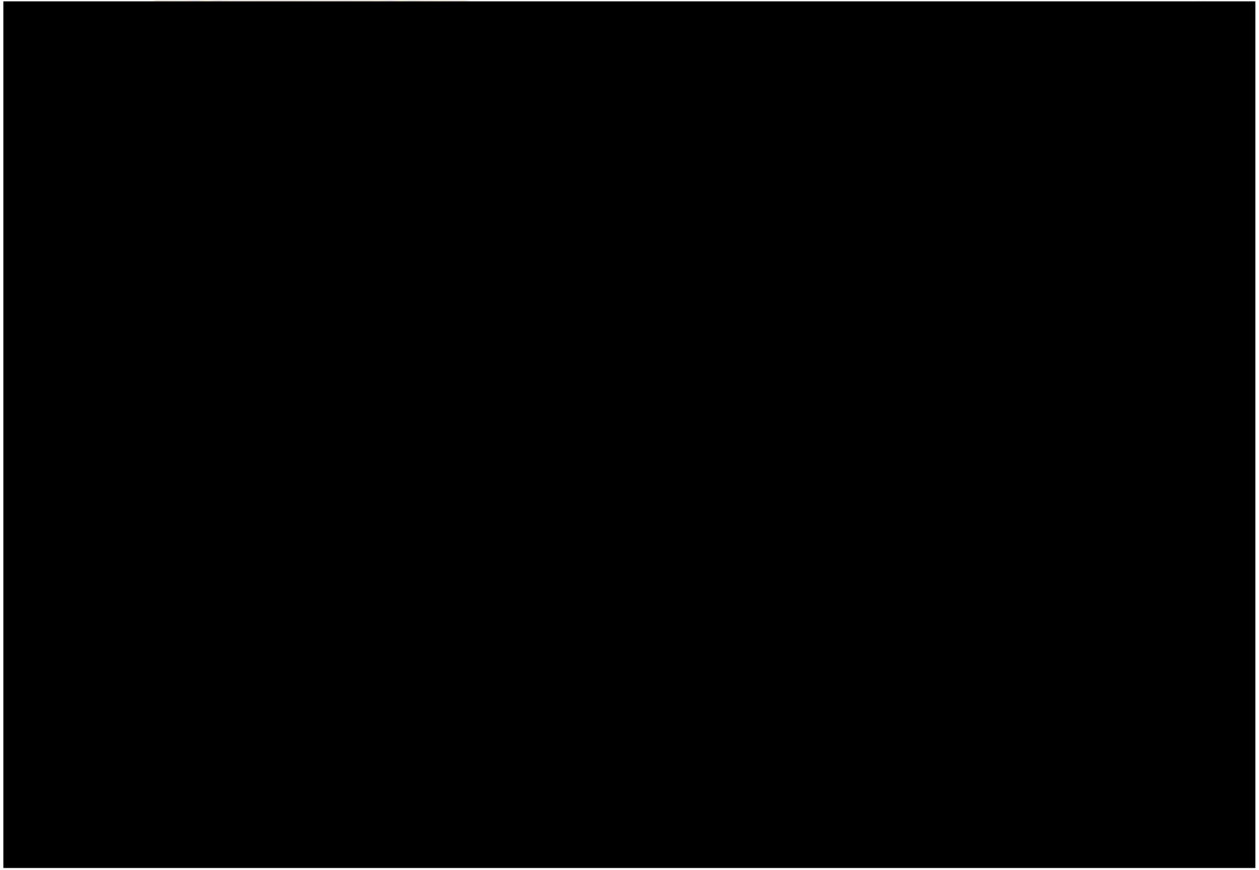
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[b] a second transistor whose source is coupled to a drain of the first transistor;	The pixel circuit of the [REDACTED] has a second transistor whose source is coupled to a drain of the first transistor. As shown in the [REDACTED] the source of the second transistor T1 is coupled to the drain of the first transistor T2. 

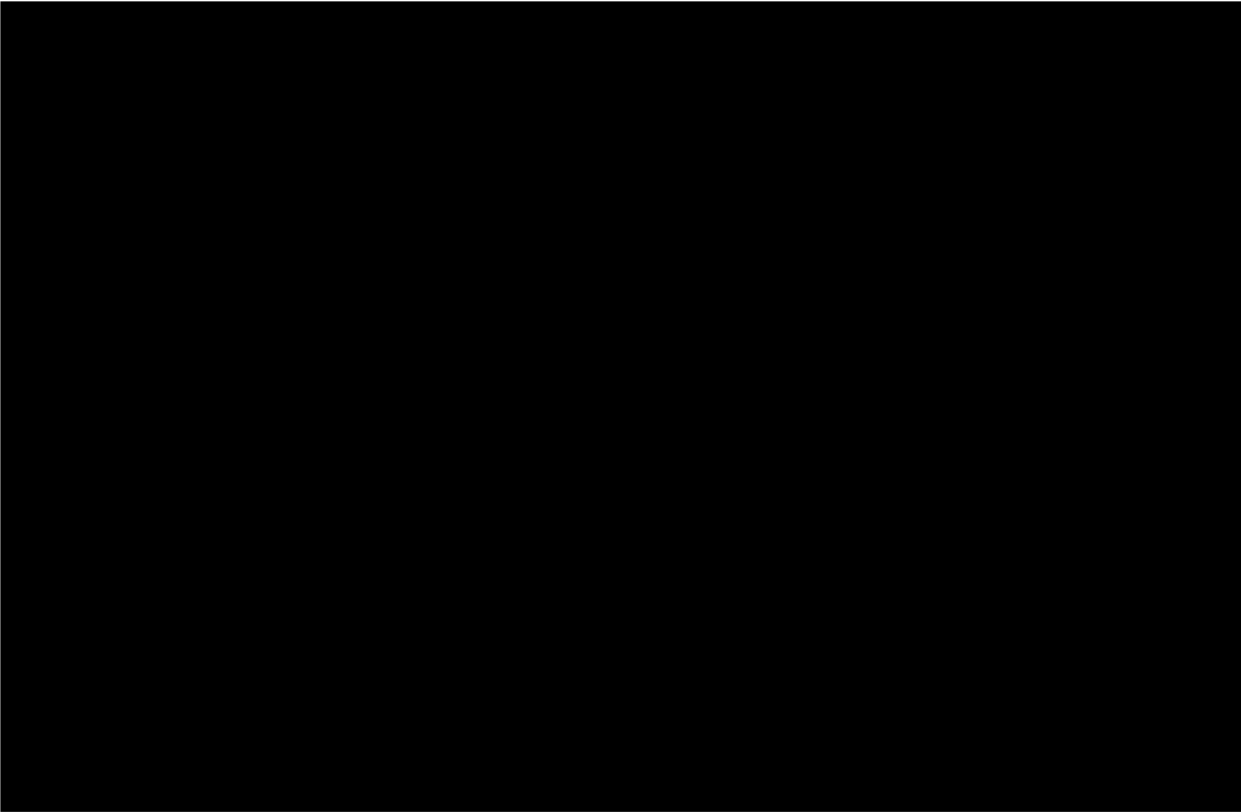
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[c] a third transistor whose drain and source are connected between a gate and a drain of the second transistor;	The pixel circuit of the [REDACTED] has a third transistor whose drain and source are connected between a gate and a drain of the second transistor. As shown in the [REDACTED] a third transistor T3 has its drain and source connected between gate and drain of the second transistor T1, respectively. 

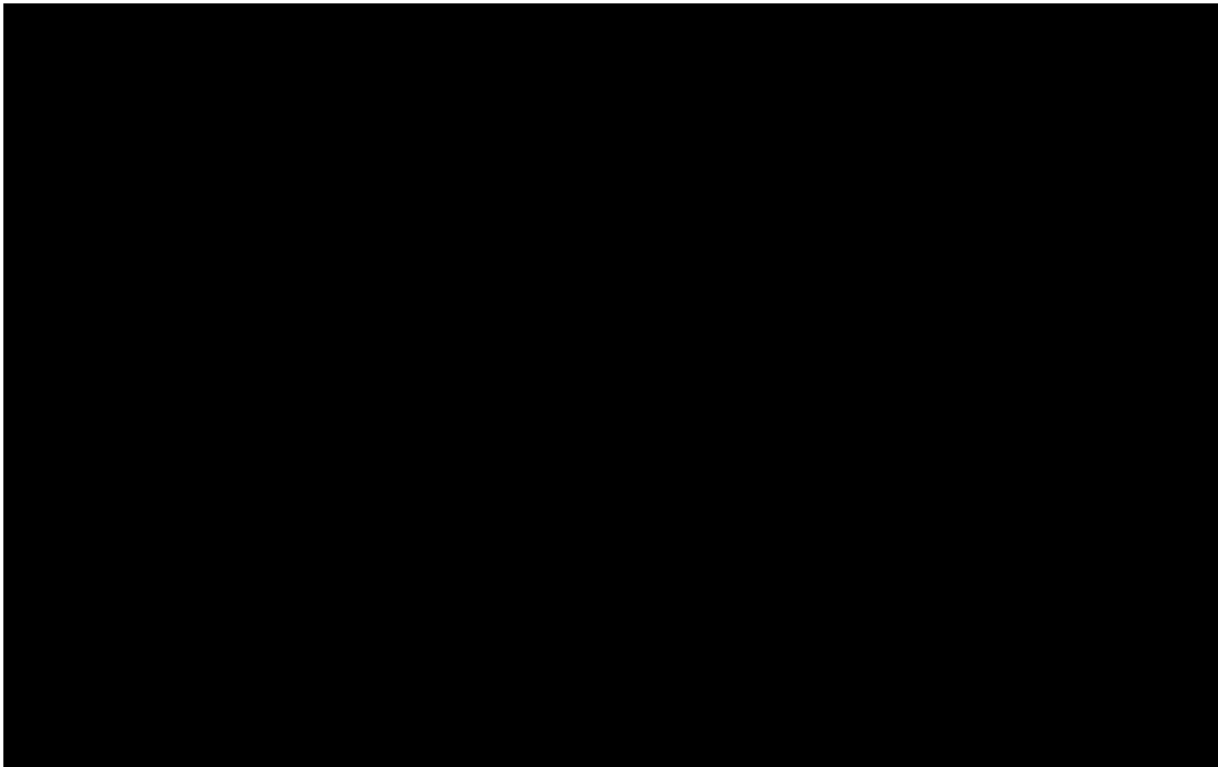
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[d] a fourth transistor including a gate to which a current light-emitting signal is applied, a source to which a power supply voltage is applied, and a drain coupled to the source of the second transistor;	The pixel circuit of the [REDACTED] has a fourth transistor including a gate to which a current light-emitting signal is applied, a source to which a power supply voltage is applied, and a drain coupled to the source of the second transistor. As shown in the [REDACTED] a fourth transistor T5 has a source coupled to [REDACTED] and a drain coupled to the source of transistor T1. In response to an active (low) current light-emitting signal delivered on emission line [REDACTED] fourth transistor T5 delivers a power supply voltage from [REDACTED] to second transistor T1. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[e] a fifth transistor including a gate to which the current light-emitting signal is applied, a source coupled to the drain of the second transistor, and a drain coupled to one terminal of an electroluminescent element;	The pixel circuit of the [REDACTED] has a fifth transistor including a gate to which the current light-emitting signal is applied, a source coupled to the drain of the second transistor, and a drain coupled to one terminal of an electroluminescent element. In the [REDACTED] a fifth transistor T6 has a source coupled to a drain of second transistor T1, and a drain coupled to one terminal of an electroluminescent element (OLED). As further shown in the annotated [REDACTED] in response to an active (low) current light-emitting signal delivered on emission line [REDACTED] fifth transistor T6 turns on and delivers driving current that flows through second transistor T1 to the OLED. 

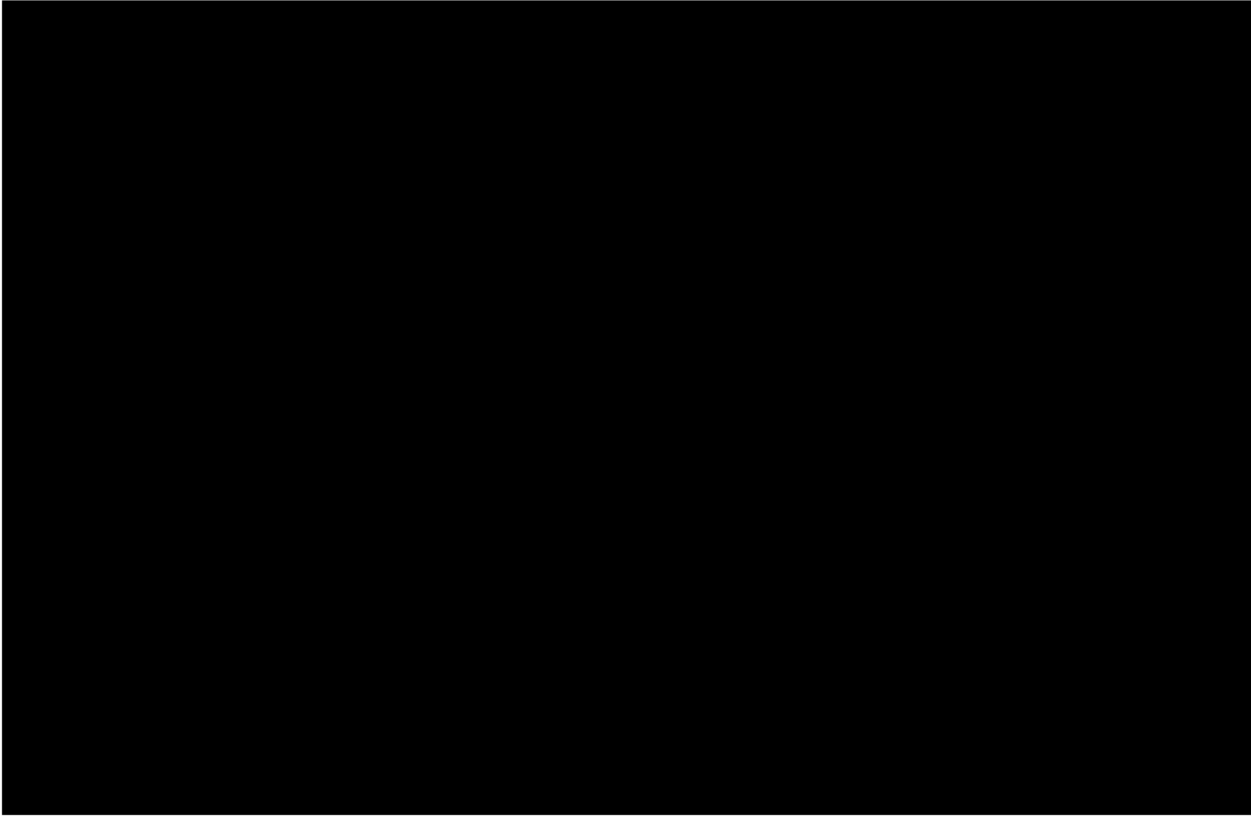
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[7] the electroluminescent element having the one terminal coupled to the drain of the fifth transistor and the other terminal grounded; and	The pixel circuit of the [REDACTED] has an electroluminescent element with one terminal coupled to the drain of the fifth transistor and the other terminal grounded. As shown in the [REDACTED] the pixel circuit of the [REDACTED] has an electroluminescent element (OLED) with a first terminal, the anode, coupled to the drain of the fifth transistor T6. The other terminal of the OLED, the cathode, is grounded to facilitate the flow of current from T6 through the anode of the OLED to the cathode in the light-emission phase. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
15[g] a capacitor in which one terminal of the capacitor is coupled to the gate of the second transistor and a power supply voltage is applied to the other terminal of the capacitor.	The pixel circuit of the [REDACTED] has a capacitor in which one terminal of the capacitor is coupled to the gate of the second transistor and a power supply voltage is applied to the other terminal of the capacitor. As shown in the [REDACTED] the lower plate (terminal) of the capacitor [REDACTED] is coupled to the gate of the second transistor 11, while a power supply voltage [REDACTED] is applied to the upper plate (terminal) of [REDACTED]. In response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] the data signal voltage (red line) on data line [REDACTED] is delivered to the second transistor 11 and to the capacitor [REDACTED] (see <i>a/so</i> claim element 15[a] above). 

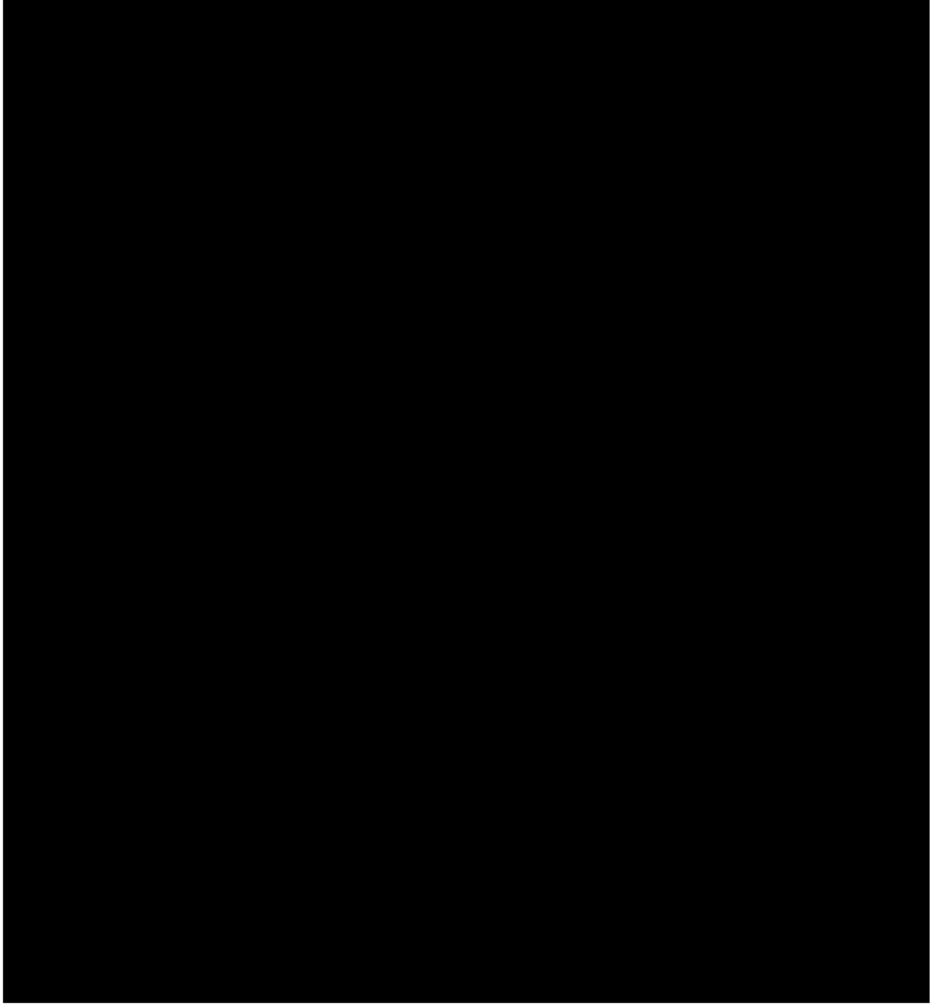
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
16. The pixel circuit in the organic light emitting device of claim 15, further comprising: a sixth transistor including a gate to which a scan signal just before the current scan signal is applied; a source coupled to the one terminal of the capacitor; and a drain to which an initialization voltage is applied.	The pixel circuit of the [REDACTED] further comprises a sixth transistor including a gate to which a scan signal just before the current scan signal is applied, a source coupled to the one terminal of the capacitor, and a drain to which an initialization voltage is applied. As shown in the [REDACTED] the sixth transistor T4 is coupled between an initialization voltage line [REDACTED] and the capacitor [REDACTED]. A scan signal (blue line) on scan line [REDACTED] that is a scan signal just before the current scan signal on scan line [REDACTED] is applied to the gate of sixth transistor T4. The source of sixth transistor T4 is coupled the one terminal of capacitor [REDACTED]. An initialization voltage (red line) is applied to the drain of sixth transistor T4 through the initialization voltage line [REDACTED]. 



U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
16. The pixel circuit in the organic light emitting device of claim 15, further comprising: a sixth transistor including a gate to which a scan signal just before the current scan signal is applied; a source coupled to the one terminal of the capacitor; and a drain to which an initialization voltage is applied. (cont'd)	As shown in the timing diagram below, the active (low) scan signal on scan line [REDACTED] is a scan signal just before the current scan signal on scan line [REDACTED]. As discussed previously, the scan signal is delivered on scan line [REDACTED] just before the current scan signal delivered on scan line [REDACTED] is applied to the gate of sixth transistor T4. The source of sixth transistor T4 is coupled the one terminal of capacitor [REDACTED]. An initialization voltage is applied to the drain of sixth transistor T4 through the initialization voltage line [REDACTED]. A large rectangular area that has been completely redacted, presumably containing a timing diagram as mentioned in the text.

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[preamble] A pixel circuit in an organic light emitting device having a plurality of data lines, a plurality of scan lines, a plurality of power lines, and a plurality of pixels each connected to one associated data line, scan line and power line of the plurality of data lines, scan lines and power lines, each pixel comprising:	The [REDACTED] includes a pixel circuit in an organic light-emitting device. For example, the [REDACTED] below of the [REDACTED] depicts the transistors T1–T7, the capacitor [REDACTED] and the OLED element. 

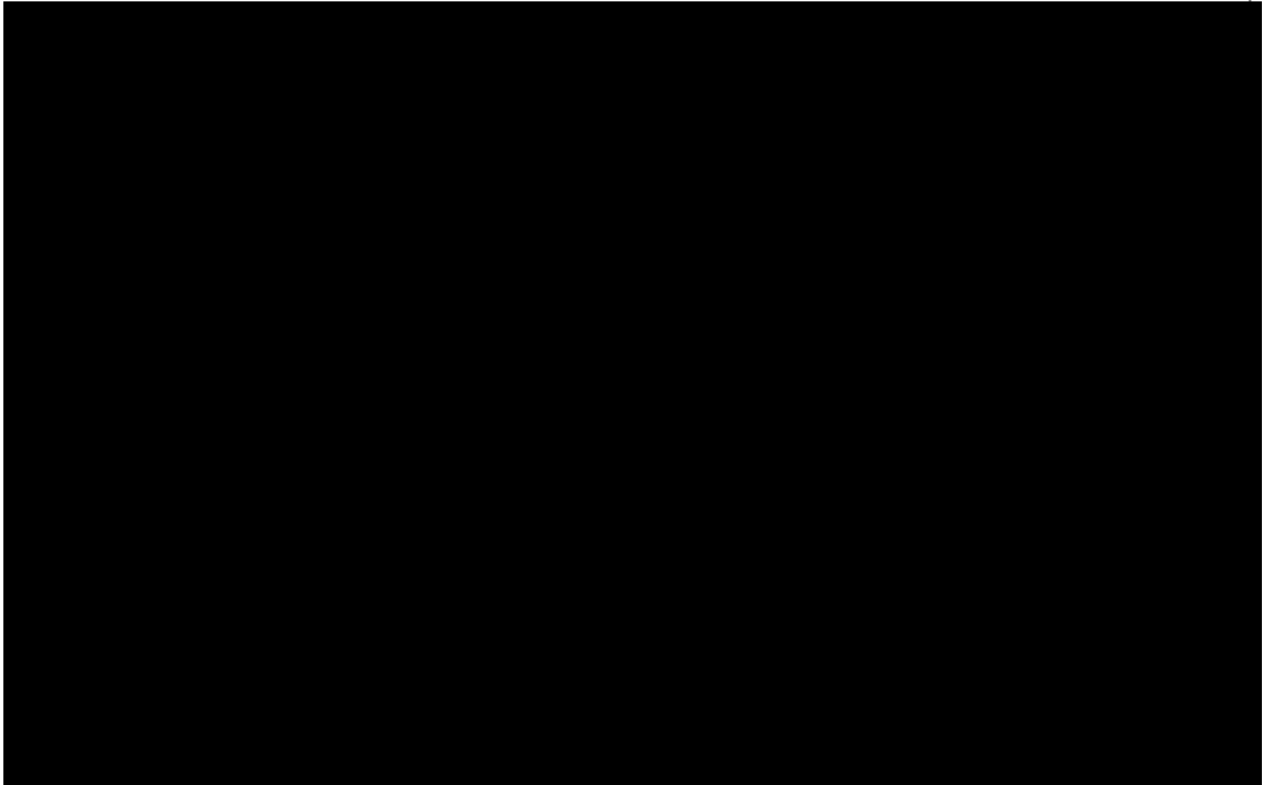


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product 
17[preamble] A pixel circuit in an organic light emitting device having a plurality of data lines, a plurality of scan lines, a plurality of power lines, and a plurality of pixels each connected to one associated data line, scan line and power line of the plurality of data lines, scan lines and power lines, each pixel comprising: (<i>cont'd</i>)	The  includes a plurality of pixel . See <i>generally</i> claims 1–16 above. The plurality of pixel circuits is found in the scan area identified below, wherein each pixel circuit is connected to an associated one of a plurality of data lines, an associated one of a plurality of scan lines, and an associated one of a plurality of power lines.. 

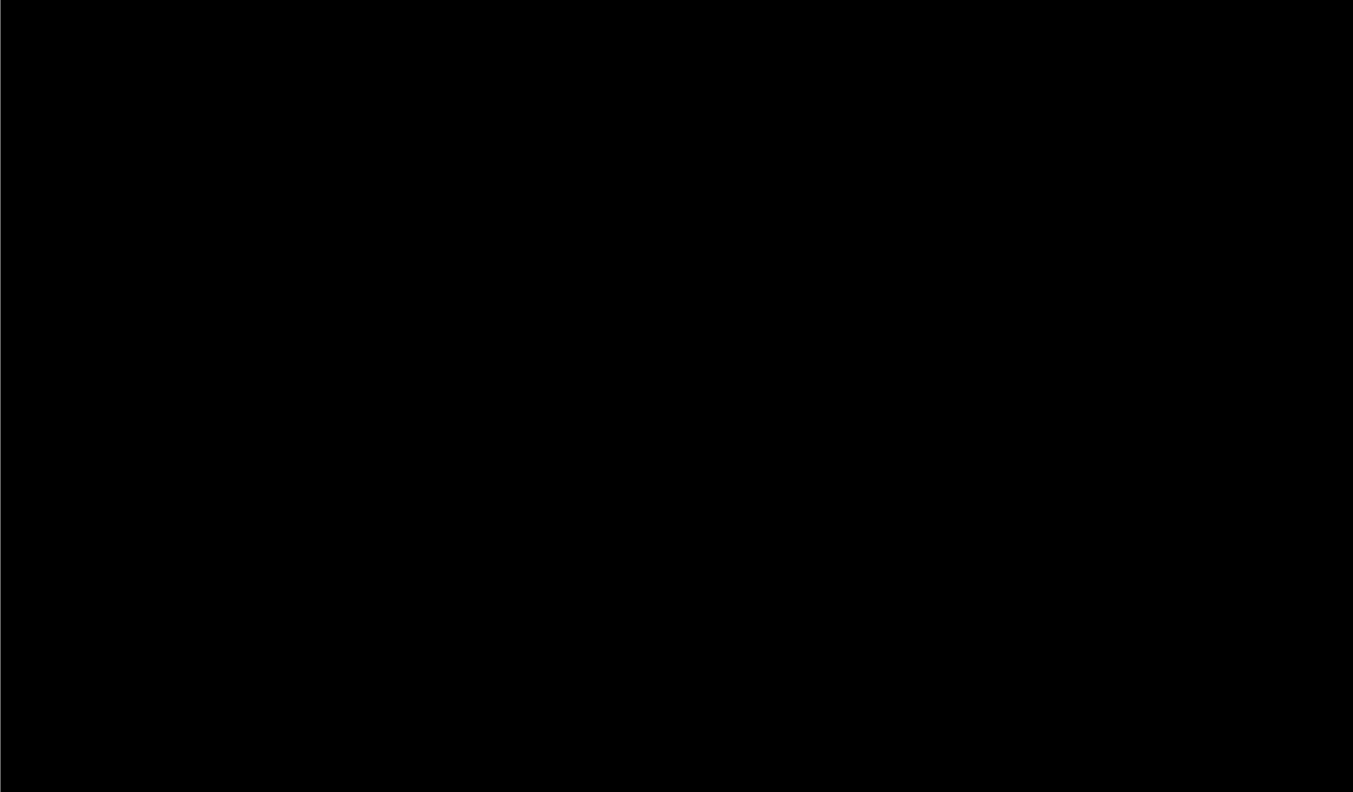


U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[preamble] A pixel circuit in an organic light emitting device having a plurality of data lines, a plurality of scan lines, a plurality of power lines, and a plurality of pixels each connected to one associated data line, scan line and power line of the plurality of data lines, scan lines and power lines, each pixel comprising: <i>(cont'd)</i>	Ex. 2020 (Galaxy S21 Teardown Photos) at 2

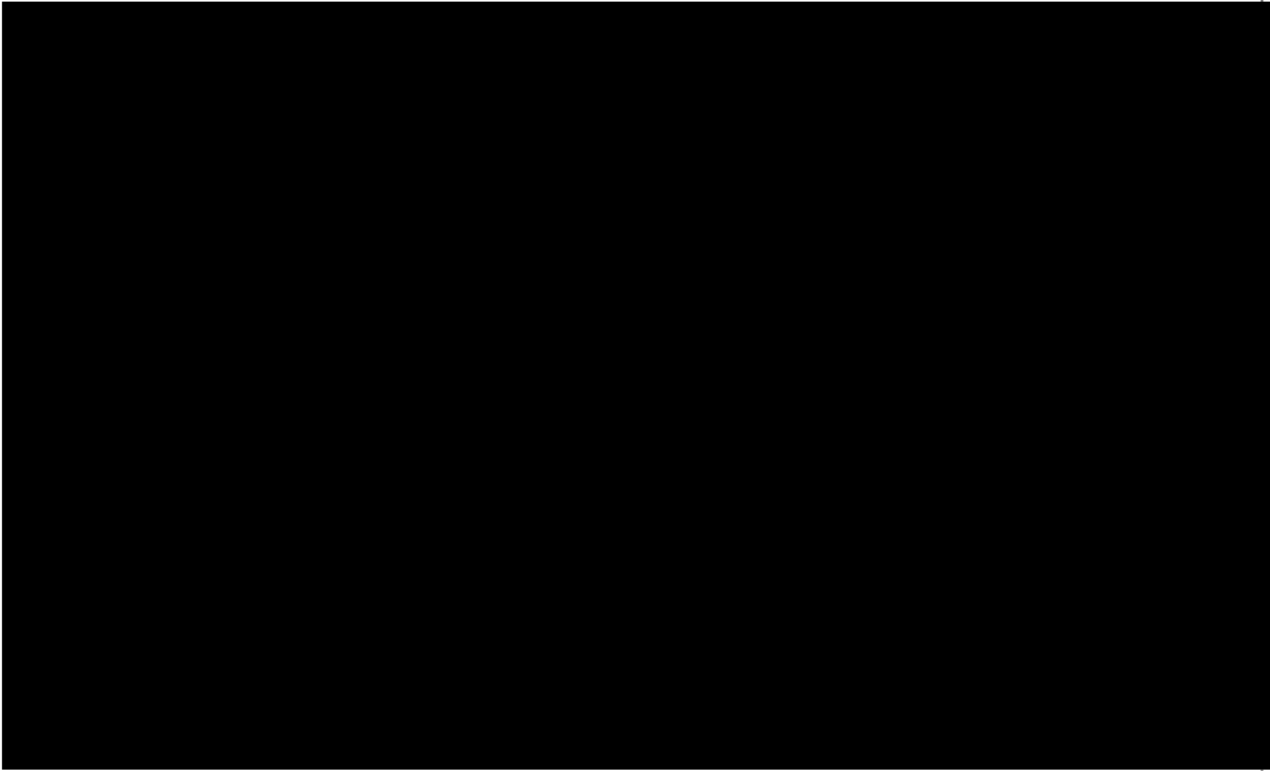
[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[a] a first transistor including a gate to which a current scan signal to be applied to the associated scan line is applied, and a source to which a data signal voltage from the data line is applied;	The pixel circuit of the [REDACTED] has a first transistor including a gate to which a current scan signal to be applied to the associated scan line is applied, and a source to which a data signal voltage from the data line is applied. As shown in the [REDACTED] a current scan signal from the scan line [REDACTED] is applied to the gate of the first transistor T2, and a data signal voltage from data line [REDACTED] is applied to the source of the first transistor T2. 

[REDACTED]

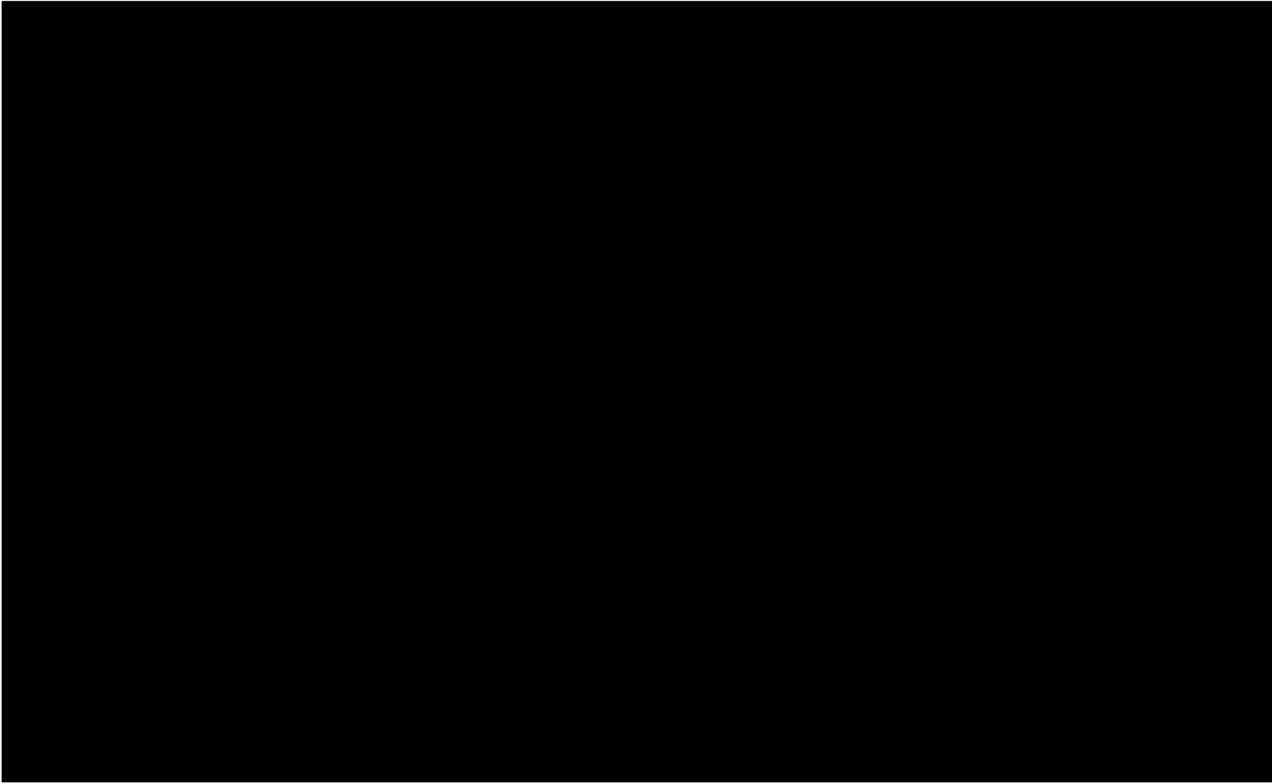
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[a] a first transistor including a gate to which a current scan signal to be applied to the associated scan line is applied, and a source to which a data signal voltage from the data line is applied; (cont'd)	As reflected in the [REDACTED] in response to an active (low) current scan line signal (blue line) delivered on scan line [REDACTED] first transistor T2 delivers the data signal voltage (red line) present on data line [REDACTED]. The annotated [REDACTED] below depicts an exemplary voltage path from data line [REDACTED] through transistors T2-T1-T3 to the gate of transistor T1. 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[b] a second transistor whose source is coupled to a drain of the first transistor;	The pixel circuit of the [REDACTED] has a second transistor whose source is coupled to a drain of the first transistor. As shown in the [REDACTED] the source of the second transistor T1 is coupled to the drain of the first transistor T2. 

[REDACTED]

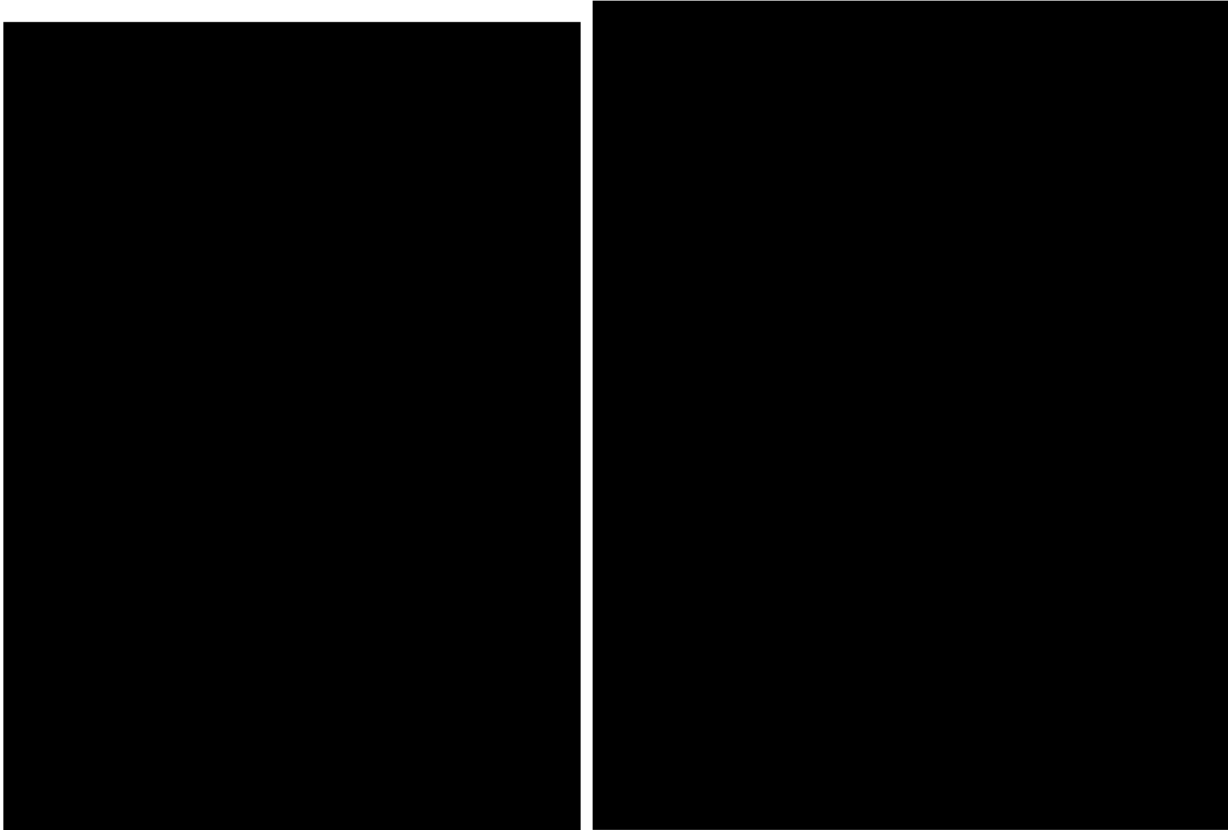
U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[c] a third transistor whose drain and source are connected between a gate and a drain of the second transistor, respectively;	The pixel circuit of the [REDACTED] has a third transistor whose drain and source are connected between a gate and a drain of the second transistor, respectively. As shown in the [REDACTED] a third transistor T3 has its drain and source connected between the gate and drain of the second transistor T1, respectively. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[d] a fourth emitting transistor including a gate to which a current light-emitting signal is applied, a source to which a power supply voltage from the power line is applied, and a drain coupled to the source of the second transistor;	The pixel circuit of the [REDACTED] has a fourth transistor including a gate to which a current light-emitting signal is applied, a source to which a power supply voltage is applied, and a drain coupled to the source of the second transistor. As shown in the [REDACTED] a current light-emitting signal on emission line [REDACTED] is applied to the gate of fourth transistor T5, a power supply voltage from [REDACTED] is applied to the source of fourth transistor T5, and the drain of fourth transistor T5 is coupled to the source of second transistor T1. 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[e] a fifth transistor including a gate to which the current light-emitting signal is applied, and a source coupled to the drain of the second transistor;	The pixel circuit of the [REDACTED] has a fifth transistor including a gate to which the current light-emitting signal is applied, and a source coupled to the drain of the second transistor. As shown in the [REDACTED] a fifth transistor T6 has a gate to which the current light-emitting signal on emission line [REDACTED] is applied, and a source coupled to a drain of second transistor T1. 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[f] an electroluminescent element including one terminal coupled to the drain of the fifth transistor and the other terminal grounded; and	The pixel circuit of the [REDACTED] has an electroluminescent element with one terminal coupled to the drain of the fifth transistor and the other terminal grounded. As shown in the [REDACTED] the pixel circuit of the [REDACTED] has an electroluminescent element (OLED) with a first terminal, the anode, coupled to the drain of the fifth transistor T6. The other terminal of the OLED, the cathode, is grounded to facilitate the flow of current from fifth transistor T6 through the anode of the OLED to the cathode in the light-emission phase. 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
17[g] a capacitor including one terminal coupled to the gate of the second transistor, and the other terminal to which the power supply voltage from the power line is applied.	The pixel circuit of the [REDACTED] has a capacitor in which one terminal of the capacitor is coupled to the gate of the second transistor and a power supply voltage is applied to the other terminal of the capacitor from the power line. As shown in the [REDACTED] the lower plate (terminal) of the capacitor [REDACTED] is coupled to the gate of the second transistor 11, and the power supply voltage [REDACTED] from the power line is applied to the upper plate (terminal) of [REDACTED] 

[REDACTED]

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
18. The pixel circuit in the organic light emitting device of claim 17, further comprising: a sixth transistor including a gate to which a scan signal to be applied to a scan line just before the associated scan line is applied, a source coupled to the one terminal of the capacitor, and a drain to which an initialization voltage is applied.	The pixel circuit of the [REDACTED] has a sixth transistor, including a gate to which a scan signal to be applied to a scan line just before the associated scan line is applied, a source coupled to the one terminal of the capacitor, and a drain to which an initialization voltage is applied. As shown in the [REDACTED] the sixth transistor T4 is coupled between an initialization voltage line [REDACTED] and the capacitor [REDACTED]. A scan signal (blue line) on scan line [REDACTED] that is a scan signal just before the current scan signal on scan line [REDACTED] is applied to the gate of sixth transistor T4. The source of sixth transistor T4 is coupled the one terminal of capacitor [REDACTED]. An initialization voltage (red line) is applied to the drain of sixth transistor T4 through the initialization voltage line [REDACTED]. 

U.S. Patent No. 7,414,599	Samsung Display AMOLED Display in Samsung Galaxy S21 Product [REDACTED]
18. The pixel circuit in the organic light emitting device of claim 17, further comprising: a sixth transistor including a gate to which a scan signal to be applied to a scan line just before the associated scan line is applied, a source coupled to the one terminal of the capacitor, and a drain to which an initialization voltage is applied. (cont'd)	As shown in the timing diagram below, the active (low) scan signal on scan line [REDACTED] is a scan signal just before the current scan signal on scan line [REDACTED]. As discussed previously, the scan signal is delivered on scan line [REDACTED] just before the current scan signal delivered on scan line [REDACTED] is applied to the gate of sixth transistor T4. The source of sixth transistor T4 is coupled the one terminal of capacitor [REDACTED]. An initialization voltage is applied to the drain of sixth transistor T4 through the initialization voltage line [REDACTED]. 