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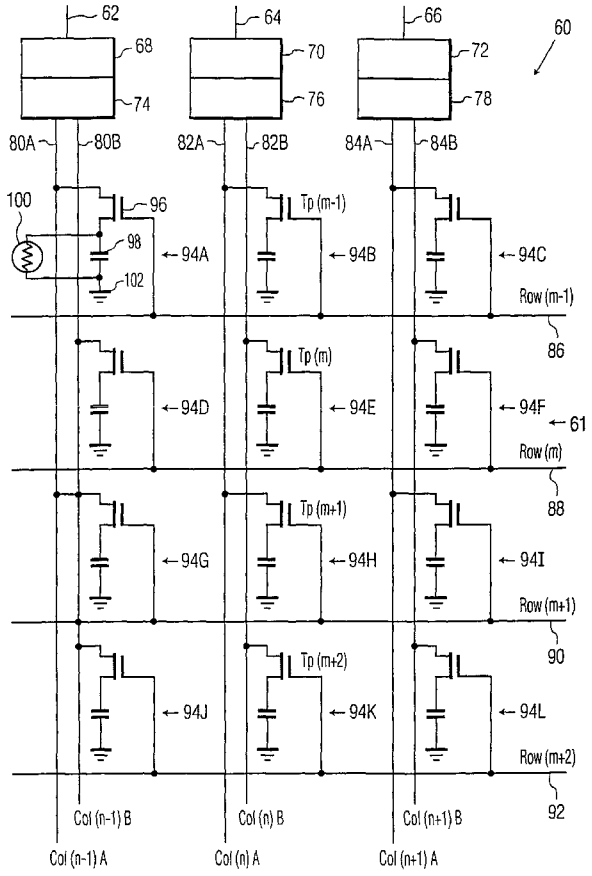
(54) Title: COLUMN DRIVING CIRCUIT AND METHOD FOR DRIVING PIXELS IN A COLUMN ROW MATRIX



(57) Abstract: A column driving circuit and method for driving pixels in a column row matrix. Specifically, the present invention provides a circuit and method that generally includes an input for receiving a signal, a multiplexing circuit for receiving the signal from the input, and a first and a second column line, wherein each column line alternates in receiving the signal from the multiplexing circuit. By splitting the signal between two column lines, overall line capacitance is reduced, as are problems associated with delays in ramp retrace.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Column driving circuit and method for driving pixels in a column row matrix

The present invention generally relates to a column driving circuit and method for driving pixels in a column row matrix. More particularly, the present invention relates to an improved circuit and method for reducing the capacitive load on the columns of the matrix to provide improved pixel driving.

In video displays, matrices are commonly utilized in which pixels are oriented in a column row format. The column driving scheme currently employed to drive the pixels is based on a common analog ramp signal that is sampled by all columns in the display. Problems associated with this architecture include a high capacitive load that each column presents to the column buffer, where a buffer amplifier is used in every column. Moreover, as the addressing frequency increases, as a result of a higher frame rate or a higher pixel count of the display, the fidelity of the sampled signal decreases.

Another problem associated with the existing architecture is ramp retrace. In particular, the ramp signal in each column must retrace rapidly to an initial state in order to maximize the time available for sampling. Specifically, before the columns of the existing architecture can be driven with the analog signal, they must first be brought to an initial state or retraced. Thus, driving the pixels is at least a two step process in which each column must: (1) retrace to initial state; and (2) apply the analog signal. Since, a fast retrace requires large current capability of the driver(s), the associated large transients in the matrix could cause undesired effects, e.g., activating unselected rows.

In view of the foregoing, there exists a need for a column driving circuit and method for reducing the capacitive load in the columns of the matrix. Moreover, a need exists for a column driving circuit and method that reduces the problems associated with ramp retrace.

It is an object of the invention to provide an improved column driving circuit and method for driving pixels in a column row matrix. Specifically, the present invention provides a column driving circuit wherein each column is split into at least two column lines. Each column line communicates with/is joined to a unique subset of rows in the matrix. By

splitting the columns into multiple column lines, the capacitance of each line is a fraction of that required by a single column. In addition, because each column is split into at least two column lines, a first column line can be retraced to the initial state while the second column line is being driven by the analog signal thus, reducing the delays associated with ramp retrace.

To this end, a first aspect of the present invention provides a column driving circuit for driving pixels in a column row matrix. The circuit comprises: (1) a multiplexing circuit for receiving a signal; and (2) a first and a second column line, wherein the column lines receive the signal from the multiplexing circuit, and wherein the first column line is in communication with different rows of the matrix than the second column line.

A second aspect of the present invention provides a method for driving pixels in a column row matrix. The method comprises the steps of: (1) receiving a signal in a multiplexing circuit; (2) selectively sending the signal from the multiplexing circuit to a first and second column line; and (3) communicating the column lines with rows of the matrix to drive the pixels, wherein the first column line communicates with different rows than the second column line.

Therefore, the present invention provides a column driving circuit and method for driving pixels in a column row matrix. The present invention reduces the problems associated with high column capacitance and ramp retrace.

Further advantageous embodiments are defined in the dependent claims.

These and other features and advantages of this invention will be more readily understood from the following detailed description of the various aspects of the invention taken in conjunction with the accompanying drawings in which:

Fig. 1 depicts a first prior art column driving circuit;

Fig. 2 depicts a second prior art column driving circuit;

Fig. 3 depicts a column driving circuit in accordance with the present invention;

Fig. 4 depicts a first alternative embodiment of a column driving circuit in accordance with the present invention;

Fig. 5 depicts a multiplexing circuit in accordance with the present invention;

Fig. 6 depicts an alternative embodiment of a multiplexing circuit in accordance with the present invention; and

Fig. 7 depicts a second alternative embodiment of a column driving circuit in accordance with the present invention.

It is noted that the drawings of the invention are not necessarily to scale. The drawings are merely schematic representations, not intended to portray specific parameters of the invention. The drawings are intended to depict only typical embodiments of the invention, and therefore should not be considered as limiting the scope of the invention. In the drawings, like numbering represents like elements.

As stated, the present invention comprises an improved column driving circuit and method for driving pixels in a column row matrix. Generally, the present invention splits each column of the matrix into a plurality (preferably two) column lines. Each column line communicates with, or is joined, to a unique subset of rows in the matrix. Accordingly, the different column lines of a single column communicate with different (e.g., alternating) rows. An analog ramp signal then is alternately applied to the column lines within each column. The resulting configuration reduces the capacitance on each column line. Moreover, as the analog signal is being applied to a first column line, a second column line can be retraced to an initial state. Therefore, there is negligible delay for a column line to retrace to the initial state.

Referring first to Fig. 1, a prior art column driving circuit 10 is depicted. The circuit is for driving pixels in a column row matrix 11. As shown, the matrix comprises columns 24, 26, and 28 and rows 30, 32, 34, and 36. Digital input signals 12, 14, and 16 are received by each column via digital to analog converter (DACs) 18, 20, and 22. Each DAC converts the digital signal to an analog signal, which is then used to drive a particular column within the matrix. Specifically, the analog signal exits each DAC 18, 20, and 22 and is received by columns 24, 26, and 28, respectively. Each column 24, 26, and 28 includes a junction 40A-L to each row 30, 32, 34 and 36. Accordingly, each row controls one junction of each column. Each junction 40A-L generally comprises a pixel transistor 42, a capacitor 44, a pixel 46 and a ground 48. It should be understood that the capacitor 44 represents a capacitance associated with pixel 46. Accordingly, pixels 46 are not explicitly shown for each junction 40A-L. However, it should be understood that each junction 40A-L includes a pixel 46.

When a video display that includes matrix 11 is refreshed, each pixel 46 must be driven. To accomplish this, each row will be individually activated for a brief period of time. This allows the analog signal in each column 24, 26 and 28 to pass through the

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