

CONFIGURABLE PANEL CONTROLLER AND FLEXIBLE DISPLAY INTERFACE

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field of the Invention

[0002] The present invention relates generally to video display controllers, and more particularly to a panel controller which dynamically configures itself to work with a display panel, in response to parameters received from the display panel.

[0003] 2. Background Art

[0004] FIG. 1 illustrates a typical display controller system 10 as known in the prior art. A personal computer and its display are chosen as being exemplary of the general principles known in the prior art. The personal computer includes a computer 12 coupled to a display device 14 such as a cathode ray tube (CRT) display or a flat panel display. The computer includes a microprocessor 16 coupled by a processor bus 18 to a chipset 20. The chipset provides support for the various computer subsystems. For example, the chipset is coupled over a memory bus 22 to a memory 24 which is typically dynamic random access memory (DRAM) of one type or another. The chipset is also coupled over a graphics bus 26 such as a peripheral component interconnect (PCI) bus or an accelerated graphics port (AGP) bus to a video card 28.

[0005] The video card includes a video memory 30 which stores data representing images, textures, and so forth for display. A graphics controller 34 performs various operations upon those data, and outputs the resulting pixel data via interface logic 36. The interface logic connects the video card to the display device over a video link 38 which is typically any of the analog or digital display interfaces, such as VGA, LVDS, DVI, etc. Corresponding interface logic 40 in the display device receives the pixel data, typically in red-green-blue (RGB) format, which are then handed to a panel controller 42.

[0006] The panel controller is coupled over a panel controller bus 44 to a set of digital-to-analog converters (DACs) 46. The DACs are connected over an analog bus 48 to the row and column drivers, which drive the actual display panel 50. The panel is sometimes referred to as the "glass" regardless of whether it is actually constructed of glass or some other material. The panel controller, DACs, and/or other components of the display device may be powered or controlled by a voltage regulation module (VRM) 52.

[0007] Display panels come in a wide variety of sizes, resolutions, color depths, and so forth, from a variety of manufactures, and using a wide variety of panel controller interfaces 44. At present, the panel controller must be custom-designed to work with one specific model of display panel. This results in expensive panel controllers, and myriad stock-keeping unit (SKU) numbers, which again raises costs for display device manufacturers. The industry has more or less standardized the video link 38 protocols, connectors, and electrical characteristics, but has not, to date, addressed the problem of customized panel controllers and panel controller interfaces or buses.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention will be understood more fully from the detailed description given below and from the accom-

panying drawings of embodiments of the invention which, however, should not be taken to limit the invention to the specific embodiments described, but are for explanation and understanding only.

[0009] FIG. 1 shows a prior art system with a custom panel controller.

[0010] FIG. 2 shows a system according to the present invention, using a reconfigurable panel controller.

[0011] FIG. 3 shows an exemplary set of signals connecting the panel controller to the display panel.

[0012] FIG. 4 shows an exemplary timing diagram for signals in a power-on configuration cycle, in which the display panel provides parameters to configure the panel controller to work with it.

[0013] FIG. 5 shows an exemplary timing diagram for signals in a data transfer from the panel controller to the display panel.

[0014] FIG. 6 shows one embodiment of a ping-pong buffer system for coalescing data for transmission from the interface to the display sequencer.

[0015] FIG. 7 shows one embodiment of a reconfigurable panel controller according to this invention.

[0016] FIG. 8 shows a system having its graphics engine and panel controller in one assembly, and its display panel in another assembly.

DETAILED DESCRIPTION

[0017] FIG. 2 illustrates a system 60 employing this invention. Again, for ease of illustration, the system is described with reference to a computer 62 and a display device 64, but the invention is not limited to this exemplary case. The invention may be practiced in any electronic or optical system in which a panel controller communicates with a display panel. The system may, in some embodiments, be constructed as a television, a personal computer, a cellular telephone, or any other device.

[0018] The illustrated system has an improved video card 66 which incorporates the configurable panel controller 68 of the invention. The interface logic 70 of the video card communicates over a communication link 72 to the interface logic 74 of the display device, according to any suitable electrical or optical protocol, using any suitable transport medium, such as serial or parallel wiring, fiber optic cabling, coaxial cable, radio or other wireless link, or the like. The reader should note that the link 72 corresponds more closely to the link 44 (of FIG. 1) than to the link 38 (of FIG. 1), in some respects.

[0019] The display device is shown in slightly more detail in FIG. 2 than in FIG. 1. The row drivers it 80 and column drivers 78 drive the pixel data to the display panel, under control of a display sequencer 82. Power-on configuration logic 76 may provide, for example, power-on self testing (POST) of the various functionalities of the display device. The POST logic may also provide configuration parameters to the panel controller upon reset, a reconfiguration command, a wake-up signal, or other such triggering event. The details of the configuration parameters will be discussed later.