Abstract: The present invention relates to an image display device comprising a mainboard, a power supply unit with a standby power layer, the standby power layer of the power supply unit fulfilling instant-on function in the event the image display device is manually switched on, the image display device further being connectible with a pluggable graphics module in signal communication therewith, such that an electronic board of the external pluggable graphics module is suppliable by the power supply unit.
Description

STABD-BY POWER MANAGEMENT IN AN IMADE DISPLAY DEVICE HAVING
WAKE-ON-LAN FUNCTION

[0001] The present invention relates to an image display device which can be
remotely woken from a remote location in standby mode without
compromising non-elevated level standby power consumption.

[0002] An image display device such as a flat panel TV (i.e. LCD TV, LED TV),
smart board, projection device etc. can be remotely activated through a
network connection to regularly fulfill certain tasks. For instance, a smart
board in a school can be operated from a remote location to give a
presentation to the students or lecturers. In this respect, it is to be noted
that pluggable graphics modules are commercially available as a separate
unit to be instantly pluggable with an image display device to fulfill more
advanced functions, for instance features associated with a smart board.

[0003] It is to be noted that an image display device in standby mode typically
receives power but is as such not operational. In other words, it will
typically not respond to a network signal since the mainboard of the same
only ensures that the device can fulfill "instant-on" functions. Typically, an
image display device such as a LCD TV is in standby mode when it is
plugged in, but is not turned on. It is not on but it is ready to receive a
signal from the remote control.

[0004] Among others, a prior art publication in the technical field of the invention
may be referred to as EP1261122, which discloses a switching power
supply unit comprising a timing generating circuit which receives a first
control signal formed by a rectifier-transistor driving circuit and forms a
second control signal based on the first control signal. The second control
signal is supplied to a control electrode of the rectifier transistor. The first
control signal is synchronized with the switching operation of a half-bridge
circuit, and the second control signal exceeds a threshold voltage of a
rectifier transistor at a timing substantially equal to the timing that one
edge of the first control signal is generated and falls below the threshold
voltage of the rectifier transistor at a timing earlier by predetermined time
than the timing that the other edge of the first control signal is generated.
[0005] The problem associated with the network connection procedures of an image display device to which an external pluggable graphics module is connected originates from the fact that when the pluggable graphics module is not powered during the standby mode, no wake-on-LAN signal is processable and the image display device will accordingly not be turned on.

[0006] The present invention, in this regard, provides a circuit arrangement by which the pluggable graphics module is continually powered by the image display device to receive a wake-on-LAN signal while the latter remains in standby mode. The simplistic yet advantageous circuit of the invention affords a very effective and quick solution for providing a remotely activatable image display device in signal connection with a pluggable graphics module.

[0007] The present invention provides a circuit arrangement by which the pluggable graphics module is continually powered by the image display device to receive a wake-on-LAN signal while the latter remains in standby mode as provided by the characterizing features defined in Claim 1.

[0008] Primary object of the present invention is to a provide circuit arrangement by which the pluggable graphics module is continually powered by the image display device to receive a wake-on-LAN signal while the latter remains in standby mode.

[0009] The present invention proposes an image display device having a mainboard and a power supply unit with a standby power layer. The standby power layer of said power supply unit typically provides that the image display device can be manually turned on, for instance by means of a remote control. The image display device is electrically connectible with a pluggable graphics module in signal communication therewith, by means of a supported interface such as for instance the HDMI interface and the UART (Universal Asynchronous Receiver/Transmitter) connector.

[0010] The electronic board of the external pluggable graphics module is normally not powered by the power supply unit. According to the invention, the power supply unit comprises an additional power layer connectible in electrical power communication with the electronic board of said pluggable
graphics module in standby mode of the image display device. The supply unit of the image display device is configured to receive a signal applied by the electronic board of the pluggable graphics module in the event a wake-on-LAN signal is received by the pluggable graphics module. In this case, the mainboard of the image display device is energizable by the regular operational power output layer of the power supply unit.

[0011] Accompanying drawings are given solely for the purpose of exemplifying an image display device in signal connection with a pluggable graphics module, whose advantages over prior art were outlined above and will be explained in brief hereinafter.

[0012] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.

[0013] Fig. 1 demonstrates the principal components of an image display device in the form of a flat panel TV in signal connection with a pluggable graphics module according to the present invention.

[0014] Fig. 2a demonstrates a conceptual comparative diagram providing the operational effect of the present invention.

[0015] Fig. 2b demonstrates a general flow diagram representation of the operational steps according to the present invention.

[0016] The present invention proposes an image display device in the form of a flat panel TV (i.e. LCD TV, LED TV), smart board, projection device etc. in signal connection with an external pluggable graphics module. The principal components involved in the configuration according to the present invention are demonstrated in Fig. 1 in respect of a flat panel TV.

[0017] To this end, a mainboard of an image display device is powered by a power supply unit of the same and an external pluggable graphics module's electronic board also suppliable by the power supply unit does not consume any active power when the image display device is in standby mode. This results in that the electronic board of the pluggable graphics module is only powered when the image display device is turned on by a user, upon which all the components of the image display device
including the panel and the mainboard thereof are powered.

Pluggable graphics modules or processors are commercially available products provided under the open pluggable specification (OPS) standard. A pluggable graphics module typically incorporates a hard disk and a robust CPU, eliminating the need for an external PC, cabling, mounting and power supply.

The external pluggable graphics module is typically equipped with a network board, or a network interface board, which is commonly referred to as a network adapter. The network adapter can be built into the main electronic board of the module or may be built separately. In addition, the pluggable graphics module may also comprise a wireless communication interface so that the image display device can be remotely connected in a wireless (Wi-Fi) network.

Due to the fact that the mainboard of the image display device only ensures that the image display device can only fulfill "instant-on" function, the pluggable graphics module will typically not respond to a network signal while the image display device is in standby mode.

To this end, the present invention proposes an additional power layer in electrical connection with the power supply unit of the image display device and in electrical power communication with the electronic board of the pluggable graphics module. This results in that in the event that a wake-on-LAN signal is detected by the pluggable graphics module, the electronic board will then apply a respective signal to the power supply unit, upon which the operational power output layer of the same will energize the mainboard of the image display device. To this end, the power supply unit of the image display device according to the present invention is configured to receive a respective signal applied by said electronic board of the pluggable graphics module, upon which the mainboard is energized.

Accordingly, the image display device is actually turned on either when the user manually switches the device on or the network adapter of the pluggable graphics module receives a wake-on-LAN signal and the electronic board thereof in electrical power communication with the power
supply unit applies a respective signal thereto.

[0023] In a nutshell, the present invention proposes an image display device comprising a mainboard, a power supply unit with a standby power layer, said standby power layer of the power supply unit fulfilling instant-on function in the event the image display device is manually switched on, the image display device further being connectible with a pluggable graphics module in signal communication therewith, such that an electronic board of the external pluggable graphics module is suppliable by the power supply unit.

[0024] The image display device according to the present invention provides that said power supply unit comprises an additional power layer connectible in electrical power communication with an electronic board of the pluggable graphics module, the power supply unit of the image display device being configured to receive a signal applied by the electronic board of the pluggable graphics module in the event a wake-on-LAN signal is detected by the pluggable graphics module, upon which the mainboard of the image display device is energizable by the operational power output layer of the power supply unit. The electrical circuit of the additional power layer of the power supply unit can be realized in a plurality of circuit arrangements and the circuit design alternatives providing the operational concept of the invention will be appreciated by the person skilled in the art.

[0025] In this regard, it is to be noted that the present invention provides a circuit arrangement by which the pluggable graphics module is continually powered by the image display device to receive a wake-on-LAN signal while the latter remains in standby mode and therefore exhibits a non-elevated power consumption that is in compliance with the requirements of the standby mode. The simplistic yet advantageous circuit of the invention affords a very effective and quick solution for providing a remotely activatable image display device in signal connection with a pluggable graphics module.
Claims

1. An image display device comprising a mainboard, a power supply unit with a standby power layer, said standby power layer of said power supply unit fulfilling instant-on function in the event the image display device is manually switched on, the image display device further being connectible with an external pluggable graphics module in signal communication therewith, such that an electronic board of said external pluggable graphics module is suppliable by the power supply unit characterized in that, the power supply unit comprises an additional power layer connectible in electrical power communication with an electronic board of the pluggable graphics module in standby mode of the image display device and said power supply unit of the image display device is configured to receive a signal applied by the electronic board of the pluggable graphics module in the event a wake-on-LAN signal is detected by the pluggable graphics module, upon which the mainboard of the image display device is energizable by an operational power output layer of the power supply unit.

2. An image display device as in Claim 1, characterized in that the pluggable graphics module is not powerable by the operational power output layer of the power supply unit in standby mode of the image display device.

3. An image display device as in Claim 1 or 2, characterized in that the image display device is electrically connectible with the pluggable graphics module by means of an HDMI interface and an UART connector.

4. An image display device as in Claim 1 or 2, characterized in that the pluggable graphics module is equipped with a network interface board.
Fig. 1

Image Display Device Panel

- Power Supply Unit of the Image Display Device
- Electronic Board of the Pluggable Graphics Module
- Mainboard of the Image Display Device
A. CLASSIFICATION OF SUBJECT MATTER
INV. G09G5/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G09G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>Y</td>
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[X] Further documents are listed in the continuation of Box C.  
[X] See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search: 31 March 2014
Date of mailing of the international search report: 08/04/2014

Name and mailing address of the ISA/Authorized officer:
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016
Giancane, Iacopo
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