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(54) Title: A SYSTEM AND METHOD FOR DRIVING LIGHT EMITTING LOAD

(57) Abstract: The invention generally relates to a system and method for driving current-driven devices (loads) such as light emitting diodes.

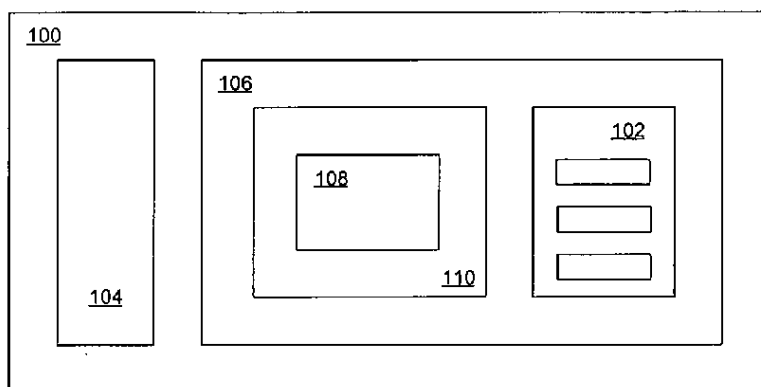


Figure 1

(12) PATENT APPLICATION PUBLICATION

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(57) Abstract :

The invention generally relates to a system and method for driving current-driven devices (loads) such as light emitting diodes (L

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We claim:

1. A system 100 for driving a light emitting load unit 102, the system 100 comprises:
 - a central processing unit 104 for generating a quasi-continuous waveform to drive the light emitting load 102;
 - a system input and protection module 106 for continuously monitoring the health of the system 100 and providing feedback to the central processing unit 104;
 - a capacitor bank 108 having plurality of capacitors to act as an energy storage bank and for supplying required energy for driving light emitting load 102; and
 - a control module 110 for controlling the charging and discharging of the capacitor bank based on the feedback from central processing unit and the charge available in the capacitor bank.

2. The system 100 as claimed in claim 1, where in the control module 110 comprises:
 - a charging control module for controlling the charging of the capacitors at a predefined charging rate; and
 - a discharge control module for supplying predefined voltage & current pulses across the light emitting load.

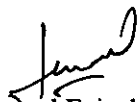
3. The system 100 as claimed in claim 2, wherein the charging control module have a high side driver module with closed loop feedback control mechanism and charging termination function in communication with the central processing unit.

4. The system 100 as claimed in claim 2, wherein the discharging module have a low side driver module having control switch in communication with the central processing unit

for discharging current from capacitor bank based on switching cycle of the light emitting load.

5. The system 100 as claimed in claim 3 or 4, wherein the switch are field effect transistor (FET) switch.
6. The system 100 as claimed in claim 1, wherein the central processing unit have a timer and Counter module an Analog/Digital module and an Input/Output control module.
7. The system 100 as claimed in claim 1, wherein the capacitors are low equivalent series resistor (ESR) high density capacitors.
8. The system 100 as claimed in claim 1, wherein the light emitting load consist of light emitting diodes (LEDs), Organic light emitting diodes (OLEDs) or Laser diodes.

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FIELD OF INVENTION

The invention generally relates to a system and method for driving current-driven devices (loads) such as light emitting diodes (LEDs).

BACKGROUND

A light emitting diodes (LEDs) requires a driver arrangement/circuit to operate. The driver arrangement/Circuit controls the operation of LED. There are various known driver arrangement/Circuit for operating LEDs. One such arrangement/circuit is known as Quasi Continuous mode of Operation. The Quasi Continuous mode operates LEDs in such a way that the power supply is switched on/Off periodically for certain time intervals, which are short enough to reduce thermal effects significantly, but still long enough that the LED process is close to steady state. The commercial drivers often employ power conversion topology to drive LED and has a limitation of connecting number of LED's and its output drive current.

Hence there is a need for a system and method for driving light emitting loads.

SUMMARY OF THE INVENTION

According to embodiments of the invention, a system and method for driving a light emitting load unit is disclosed. The disclosed system includes a central processing unit for generating a quasi-continuous waveform to drive the light emitting load, a system input and protection module for continuously monitoring health status and providing system health related feedbacks to central processing unit and a capacitor bank having plurality of capacitors to act as an energy storage bank and for supplying required energy for driving light emitting load. The system further includes a control module for controlling charging and discharging of the

capacitor bank based on the feedback from central processing unit and the charge available in the capacitor bank.

BRIEF DESCRIPTION OF DRAWINGS

Other objects, features, and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawings:

Figure 1 illustrates an exemplary block diagram of a system for driving a Lighting load according to an embodiment of the invention;

Figure 2 illustrates an exemplary system for driving a Light emitting diode (LED) Lighting unit according to an embodiment of the invention; and

Figure 3 illustrates an exemplary circuit for driving a LED Lighting unit according to another embodiment of the invention.

DETAILED DESCRIPTION OF DRAWINGS

The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of exemplary embodiments. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

Figure 1 illustrates an exemplary block diagram for a system 100 for driving a light emitting load unit 102 according to an embodiment of the invention. The light emitting load unit 102

may include a plurality of light emitting diodes (LED's), organic light emitting diodes (OLEDs) or Laser diodes. The light emitting load may be so arranged to have a proper isolation and efficient thermal management so as to maximize the lifecycle.

The system 100 further includes a central processing unit 104 for generating a quasi-continuous waveform to drive the light emitting load 102. The selection of central processing unit 104 may be based on the light emitting load 102 operating time, duty cycle & operating frequency etc. According to an embodiment, the central processing unit 104 is an integrated circuit (IC). The system 100 may include one or more sub component for addressing power, clock and reset requirements of the central processing unit 104. According to an embodiment the central processing unit 104 may have a timer and counter module (not shown), an Analog/ Digital module and an Input/Output control modules (not shown). The timer and counter module may be configured to satisfy the minimum timing requirement of light emitting load 102. The Analog/Digital module and the Input/output control module may define a safety thresholds of the system 100. Based on the defined threshold limits the health of the system 100 may be monitored and controlled by the central processing unit 104.

The system may further include a system input and protection module 106 for continuously monitoring input voltage and providing feedback to the central processing unit 104. The system input and protection module 106 may provide an external power interface and continuously monitor health status of the system 100 to avoid the risk of system 100 entering in to abnormal behaviour. According to another embodiment, the system 100 may further includes one or more protective features such as over current protection over voltage protection, charge current limit, discharge current limit, under voltage lock out, transient voltage suppressor, short circuit protection etc.

The system 100 may further includes a capacitor bank 108. According to an embodiment, the capacitor bank 108 may have a plurality of capacitors to act as an energy storage bank and for supplying required energy for driving the light emitting load 102. According to yet another embodiment, the capacitor bank 108 may include a plurality of low equivalent series resistor (ESR) high density capacitors. The number/density of the capacitors in the capacitor bank 108 may depend on the type, number of light emitting load 102, drive current output, light output (Brightness) and the optical coverage area (Light Pattern). Proper isolation and thermal management shall be planned to increase the capacitor lifecycle. According to embodiments of the invention, the capacitor bank 108 may be scalable thereby enabling a single driver circuit for various lighting load applications. According to another embodiment the input power source voltage may be slightly higher than the output voltage (load side) to avoid steady state behaviour of the capacitors.

The system 100 further includes a control module 110 according to an embodiment of the invention. The control module 110 may control the charging and discharging of the capacitor bank 108 based on the feedback from central processing unit 104 and the charge available in the capacitor bank 108. According to yet another embodiment, the control module 110 may include a charging control module for controlling the charging of the capacitor bank 108 at a predefined charging rate and a discharge control module for supplying predefined voltage & current pulses across the light emitting load.

The charging control module may further include a high side driver module with closed loop feedback control mechanism and charging termination function to control the charging of the capacitor bank 108 in communication with the central processing unit 104. According to yet

another embodiment, the discharging control module may further include a low side driver module having control switch for discharging current from capacitor bank based on switching cycle of the light emitting load 102 and in communication with the central processing unit 104. According to another embodiment, the charging control module may include one or more resistors. The resistors may control the rate of charge of the capacitor bank 108 by adjusting charge current limit thresholds. According to another embodiment, the charging control module may have a feedback arrangement to ensure that the capacitor bank charges up to the recommended voltage and not to violate the pre-defined limits.

According to an embodiment, the high side field effect transistor (FET) and low side field effect transistor (FET) switches may be operated through a high precision quasi continuous waveforms from central processing unit 104.

Figure 2 illustrates an exemplary system for driving a Light emitting diode (LED) Lighting unit according to an embodiment of the invention and Figure 3 illustrates an exemplary circuit for driving a LED Lighting unit according to another embodiment of the invention.

It is understood that the above description is intended to be illustrative, and not restrictive. It is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined in the appended claims. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively.



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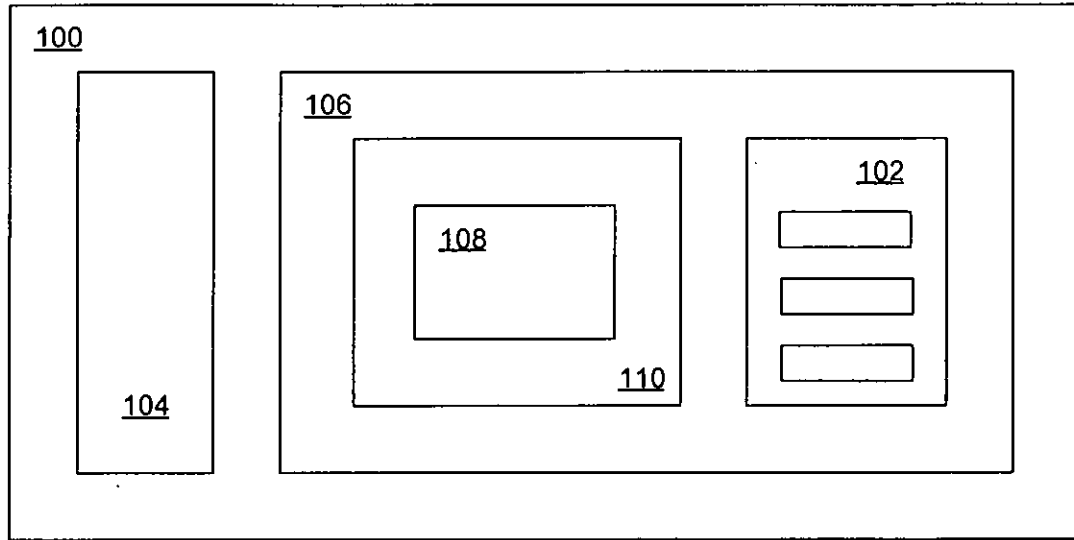


Figure 1

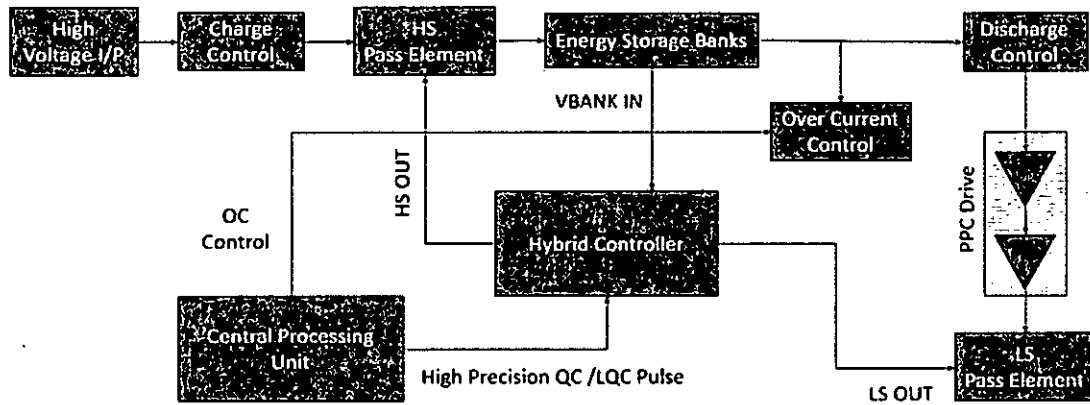


Figure 2

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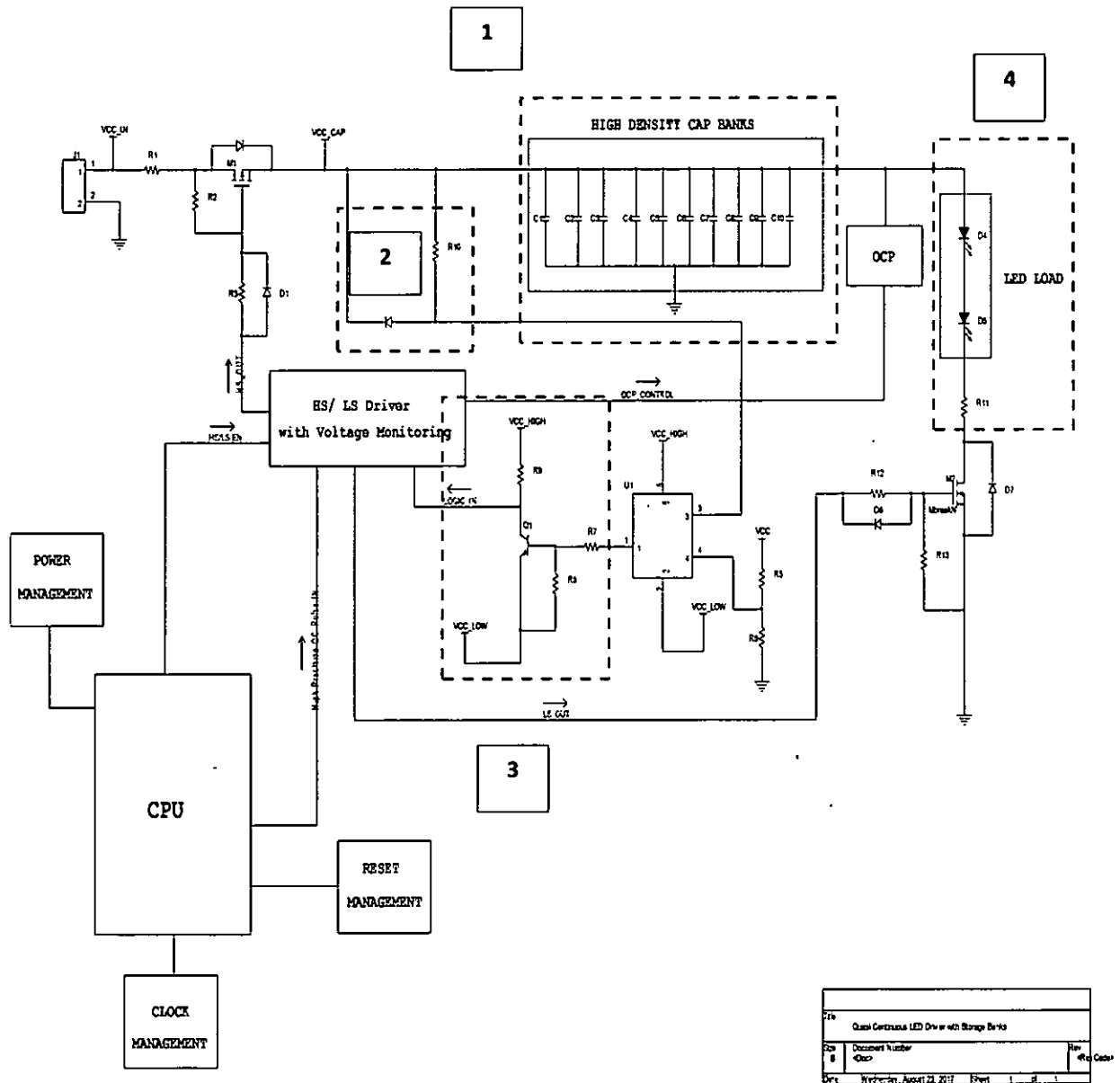


Figure 3

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