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(54) **Title:** HOT PLUG MODULE AND DRIVER FOR ILLUMINATING DEVICE AND ILLUMINATING DEVICE

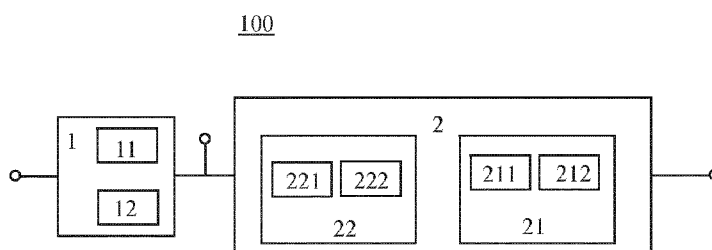


Figure 1

(57) **Abstract:** The present invention relates to a hot plug module for an illuminating device comprising: a detection unit for detecting a hot plug state to obtain a detecting state; and an impedance adjusting unit for adjusting an impedance state of the hot plug module in accordance with the detecting state, and wherein the impedance adjusting unit comprises an impedance conversion unit whose impedance can be converted; and a conversion drive unit converting the impedance of the impedance conversion unit in accordance with the detecting state to adjust the impedance state. Further, the present invention relates to a driver for an illuminating device and an illuminating device.

Description

Hot Plug Module and Driver for Illuminating Device and
Illuminating Device

5

Technical Field

The present invention relates to a hot plug module and a driver for an illuminating device and the illuminating device.

10 Background Art

LED illumination technology has advantages such as high illumination intensity, long lifetime, high efficiency and energy saving, and has been widely used at present, and in particular, illuminating devices with LED illumination technology
15 are used in both indoor environment such as stores or offices and outdoor environment such as building sites or roadsides. In a prior LED illuminating device, a constant current LED module is generally driven by a constant current LED driver with a direct current, however, since the driver circuit has
20 a larger output voltage in an open circuit state than in a state where the circuit is connected with a load, during hot plugging of a light emitting unit such as an LED lamp, the light emitting unit is damaged due to the overwhelming output voltage, and the application range of the circuit is greatly
25 limited because it cannot support hot plug.

A prior art solution proposes that a double stage converter circuit is designed in the constant current drive circuit, wherein the first stage is used for power factor correction, AC-DC voltage conversion and primary-secondary insulation,
30 and the second stage is used to perform buck conversion of a DC input voltage to a DC output voltage and supply power to a light emitting unit of an illuminating device. Though the solution can be employed in hot plug technology, the cost is increased and a more compact structure cannot be provided be-

cause of the use of a buck converter. Moreover, although the circuit so designed can greatly reduce an inrush current during hot plug, the inrush current cannot be fully damped, and thus a light emitting unit connected to the drive circuit may be damaged. Furthermore, detection delay and turn off delay during hot plugging occur in the drive circuit due to the buck converter, thus the light emitting unit may be still damaged by the inrush current.

Summary of the invention

To solve the above technical problem, the present invention provides a novel hot plug module and a drive circuit for an illuminating device, and an illuminating device using the hot plug module and the drive circuit. The hot plug module designed according to the present invention has a compact and simple circuit design, and also has a good compatibility and can be effectively compatible with any constant current LED driver. Moreover, the hot plug module has a very rapid response speed and can effectively control an inrush current that may be output to a light emitting unit and effectively restrict the current so that the light emitting unit is not damaged due to the inrush current.

An object of the present invention is achieved by a hot plug module for an illuminating device comprising: a detection unit for detecting a hot plug state to obtain a detecting state; and an impedance adjusting unit for adjusting an impedance state of the hot plug module in accordance with the detecting state, and wherein the impedance adjusting unit comprises an impedance conversion unit whose impedance can be converted; and a conversion drive unit converting the impedance of the impedance conversion unit in accordance with the detecting state to adjust the impedance state. By adjusting the impedance of the impedance conversion unit, the impedance adjusting unit enables the module to be adapted to a hot plug-in or hot plug-out state and provides the possibility of controlling and adjusting an output current of the circuit in

these states to adjust the inrush current.

According to the design of the present invention, the conversion drive unit comprises: a high impedance drive unit configured so that the impedance conversion unit is adjusted to be in high impedance; and a low impedance drive unit configured so that the impedance conversion unit is adjusted to be in low impedance. The high impedance drive unit can adjust the impedance of the module to high impedance based on a result of detection by the detection unit so as to suppress an input current in, for example, a hot plug-in state to finally suppress the inrush current, and the low impedance drive unit can adjust the impedance of the module to low impedance so as to recover the output current in, for example, a hot plug-out state.

According to the design of the present invention, the detecting state comprises a first state characterizing no load, a second state characterizing hot plug-in, and a third state characterizing hot plug-out. Such design can effectively meet the requirements of various states where the circuit is placed during hot plugging so as to ensure the stability and compatibility of the drive circuit.

Preferably, the impedance conversion unit comprises: a high impedance unit activated by the conversion drive unit in accordance with the second state and the third state; and a low impedance unit activated by the conversion drive unit in accordance with the first state and the second state, and sequentially deactivated and activated in accordance with the third state. The high impedance unit and the low impedance unit can be adapted to various states during the hot plugging to adjust an internal impedance of the drive circuit so as to change an output current to suppress the inrush current or recover the output current of the drive circuit.

According to the design of the present invention, the detection unit comprises: a buffer unit connected to a light emit-

ting unit; and a hot plug detection unit controlling the conversion drive unit based on a signal supplied by the buffer unit to adjust the impedance conversion unit. During hot plug-in or hot plug-out, the buffer unit can temporally block a transient change of the output current of the drive circuit and supply a signal to the hot plug detection unit to adjust the impedance conversion unit so as to change the internal impedance of the drive circuit.

Preferably, the high impedance unit comprises at least one electronic device with high impedance. The electronic device with high impedance can increase the impedance of the circuit during for example hot plug-in to decrease the output current.

Preferably, the electronic device is configured as any one of an NTC resistor, a PTC resistor and a semiconductor device. Such electronic device can efficiently increase the internal impedance of the circuit during, for example, hot plug-in to decrease the output current.

Preferably, the low impedance unit comprises at least one controllable switching device. Therefore, the controllable switching device can be turned on and conducted by the low impedance drive unit after, for example, hot plug-out to reduce the internal impedance of the circuit so that the output circuit is recovered to an original large value.

Preferably, the controllable switching device is configured as any one of a power MOSFET, a bipolar transistor and an IGBT. Such device can be effectively controlled by the low impedance drive unit and have small impedance after conducted to facilitate the adjustment of the internal impedance of the drive circuit.

Preferably, the high impedance drive unit comprises a second transistor, a second resistor and a third resistor, wherein the second transistor has a control electrode connected be-

tween the second resistor and the third resistor, and a reference electrode connected to ground. On/off of the second transistor can be effectively controlled by dividing the voltage by the second resistor and the third resistor, and a
5 value of the output current damped by the high impedance unit is defined by a ratio between the two resistors.

Preferably, the low impedance drive unit comprises a first resistor and a first Zener diode, wherein the first resistor is grounded through the first Zener diode, and the second
10 transistor has an operational electrode connected between the first resistor and the first Zener diode. On/off of the low impedance unit can be efficiently controlled by means of the first resistor and the first Zener diode.

Preferably, the hot plug detection unit comprises a third diode and/or a first capacitor, wherein the third diode and/or the first capacitor is grounded through the conversion drive unit. At the time of, for example, hot plug-in, the third diode supplies a signal to the high impedance drive unit through the buffer unit to activate the high impedance unit.
15 Moreover, at the time of, for example, hot plug-out, the third diode and the first capacitor can reset the buffer unit and at the same time supply a signal to the high impedance drive unit to activate the high impedance unit
20

Preferably, the hot plug detection unit further comprises a second diode, wherein a cathode of the third diode is connected to a cathode of the second diode and grounded through the second diode.
25

Preferably, the buffer unit comprises a first inductance, wherein the first inductance is grounded through a controllable switching device. The inductance can efficiently block the transient change of the output current during hot plugging and be reset at the time of, for example, hot plug-out so as to be ready for next hot plug-out operation.
30

Another object of the present invention is achieved by a driver for an illuminating device comprising a hot plug module described above. Such driver can effectively meet and adapt to various circuit states during hot plugging to ensure the stability and reliability of the illuminating device.

Preferably, the driver further comprises a first detection resistor and an output capacitor, wherein each of the first detection resistor and the output capacitor has an end connected to ground.

A further object of the present invention is achieved by an illuminating device comprising at least one light emitting unit, and a hot plug module described above and/or a driver described above. Such illuminating device has a reliable and rapidly responsive hot plug function and can effectively resist damage which may be caused by an inrush current during hot plugging.

Brief Description of the Drawings

The drawings constitute a portion of the Description for further understanding of the present invention. These drawings illustrate the embodiments of the present invention and explain the principle of the present invention together with the Description. In the drawings, the same part is represented by the same reference numeral. In the drawings,

Fig. 1 is a diagram showing functional modules of a hot plug module according to the present invention,

Fig. 2 is a diagram showing a specific circuit of an illuminating device with a hot plug module according to the present invention, and

Fig. 3a-Fig. 9b illustrate schematic diagrams for respective steps during hot-plug in and hot-plug out and corresponding

waveforms for specific signals during the respective steps.

Detailed Description of the Embodiments

Fig. 1 illustrates a diagram showing functional modules of a hot plug module 100 according to the present invention. As shown in Fig. 1, the hot plug module 100 comprises a detection unit 1 and an impedance adjusting unit 2 which adjusts (e.g., increases or decreases) an impedance of a drive circuit in accordance with a hot plug state S, for example a hot plug-in state, a hot plug-out state or a no-load state, detected by the detection unit 1. The hot plug module 100 with such design can be connected to and compatible with other prior constant current drive circuits and a light emitting unit designed as for example an LED to effectively provide hot plug function.

Specifically, the detection unit 1 is designed to include a buffer unit 11 and a hot plug detection unit 12, the buffer unit 11 can be connected directly to, for example, the light emitting unit and supply a signal to the hot plug detection unit 12 when being connected with the light emitting unit, and the hot plug detection unit 12 controls a conversion drive unit 22 disposed in the impedance adjusting unit 2 based on the signal to finally adjust an impedance conversion unit 21 of the impedance adjusting unit 2 so as to change an internal impedance of the drive circuit.

Moreover, the impedance adjusting unit 2 is further provided with a high impedance drive unit 221 and a low impedance drive unit 222, the hot plug detection unit 12 can control the high impedance drive unit 221 based on the detecting state S by the detection unit 1 in the case of for example hot plug-in to drive and activate a high impedance unit 211 disposed in the impedance conversion unit 21 to increase the impedance of the drive circuit; and in the case of for example hot plug-out, the low impedance drive unit 222 can turn off a low impedance unit 212 first so that the drive circuit

has an increased impedance because of the high impedance unit 211, and after the hot plug-out operation is completed, the low impedance drive unit 222 drives and activates the low impedance unit 212 so that the high impedance unit 211 is
5 turned off, and the internal impedance of the drive circuit is decreased. The high impedance unit 211 can be designed as a high impedance resistor 211 or any one of an NTC resistor, a PTC resistor and a semiconductor device, and the low impedance unit 212 can be designed as, but not limited to, any one
10 of a power MOSFET, a bipolar transistor and an IGBT, and other electronic devices that can achieve similar or same effects can be also used in the present invention.

Fig. 2 illustrates a diagram showing a specific circuit of an illuminating device 200 with a hot plug module 100 according
15 to the present invention. The illuminating device 200 comprises a driver 201 and a light emitting unit L connected to the driver 201, wherein the driver 201 comprises a hot plug module 100 described above, and the light emitting unit L has both terminals T1, T2 connected to respective both output
20 terminals T3, T4 of the driver 201. Moreover, the driver 201 further comprises an output capacitor Ccap and a first detection resistor Rs1 each of which has one end connected to ground and the other end connected to the hot plug module 100. Such hot plug module 100 can be compatible with any
25 other prior constant current LED driver and provide excellent hot plug function. Such driver with the hot plug module 100 can be used in for example a drive circuit having a single output current detection resistor, a drive circuit having a plurality of output current detection resistors, and a drive
30 circuit with phase cut control.

Fig. 2 shows only an illustrative embodiment of the present invention, and various modifications can be made to the present invention, for example, the present invention can be modified to have a single output path, a plurality of detection
35 resistors for adjusting a current, and a phase cut dimming function.

Fig. 3a-Fig. 9b illustrate schematic diagrams for respective steps during hot-plug in and hot-plug out and corresponding waveforms for specific signals during the respective steps, wherein the arrows in the figures schematically indicate the current flow direction and the crosses in the figures schematically indicate the component being switched off or disconnected.

While carrying out hot-plug in of the LED, the following steps are performed. As it is shown in Fig. 3a, before hot-plug in, which is in step 1, during which there is no load plugged in and the first transistor Q1 which is designed as a controllable switching device is turned on by voltage from terminal T3 through a first resistor R1. Fig. 3b shows waveforms for voltage signal at terminal T3, gate signal of the first transistor Q1 and output current of the driver. The first transistor Q1 can be designed as a field effect transistor MOSFET, or can be designed as for example a bipolar transistor or IGBT.

In step 2, at the instant of hot-plug in, as shown in Fig. 4a, a first inductance L1 maintains and blocks a transient change of the output voltage which will results in an inrush current. In this step, the first transistor Q1 is turned off by voltage from terminal T4 through a third diode D3, a third resistor R3, a second resistor R2 and a second transistor Q2, and the period thereof is determined by the base current of the second transistor and the gate capacitance of the first transistor, which could be 200ns in current embodiment. During the period, i.e. 200ns, the current across the first inductance L1 increases to an extent where the current is less than a maximum allowed LED inrush current. After the first transistor Q1 being turned off, the current across the first inductance L1 flows through the high impedance unit 211 instead of flowing through the first transistor Q1 so that there is a spike at terminal T4. The high impedance unit 211 is preferably embodied as a resistor or a positive temperature coefficient resistor PTC, a negative temperature coefficient

cient resistor NTC, or any other semiconductor device controlled by an impedance state. Fig 4b shows waveforms for voltage signal at terminal T4, gate signal of the first transistor Q1, current signal of the first inductance and output
5 current of the driver, wherein the waveforms of the current across the first inductance L1 and output current of the driver are overlapped in most part.

When the output voltage of the driver is being damped by the high impedance unit 211 after step 2, which is now in step 3,
10 as shown in Fig. 5a, the voltage at terminal T4 keeps decreasing so that the second transistor Q2 begins to turn off. A threshold for turning off the second transistor Q2 is determined by the second resistor R2, the third resistor R3 and the second transistor Q2, wherein the threshold could be em-
15 bodied as 2V, which is not too high to cause high inrush current. The first transistor Q1 is then turned on and the high impedance unit 211 is thus bypassed, whereby the driver can supply rated current to LED. Fig. 5b shows waveforms for voltage signal at terminal T4, gate signal of the first tran-
20 sistor Q1, the current across the first inductance and the output current of the driver, wherein the waveforms of the current across the first inductance L1 and output current of the driver are overlapped in most part.

In step 4, Fig. 6a shows a schematic diagram when the output
25 voltage of the driver has now been fully damped. A current flow is formed from the terminal T3 to the first detection resistor Rs1 through the LED, the first inductance and the first transistor, and the driver supplies rated current to the LED. Fig. 6b shows waveforms for voltage signal at termi-
30 nal T3, gate signal of the first transistor Q1, the current across the first inductance and the output current of the driver, wherein the waveforms of the current across the first inductance L1 and output current of the driver are overlapped in most part.

35 While hot-plug out of the LED is performed, the following

steps are carried out. As it is shown in Fig. 7a-7b, in step 5, at the instant of hot-plug out, there are two phases for the operation of the driver. In phase 1, as shown in Fig. 7a, the first inductance L1 is reset through the first transistor Q1, the second diode D2 and the first transistor Q1, and the current in the first inductance is transferred to the first capacitor and stored in the capacitor in the form of its voltage, and the period thereof is derived as $(1/4) \cdot [2 \cdot \pi \cdot (L1 \cdot C3)^{0.5}]$, and a period of 400ns is embodied in current design, which is less than 1 microsecond, and even if, for example, a hot plug-in operation is performed before the first inductance L1 being completely discharged and reset, the inrush current is not generated because the voltage at the fourth terminal T4 cannot be changed within 1 microsecond. Further, in the first phase, although the first transistor Q1 keeps conducting and the first inductance L1 is not fully reset, the output voltage of the driver is held. In phase 2, after the first inductance L1 is fully reset, voltage from the first capacitor C1 turns on the second transistor Q2, and the first transistor Q1 is then discharged through the third resistor R3, the second resistor R2, the second transistor Q2, the body diode of the first transistor Q1 and the first inductance L1. In this phase, the first capacitor is also reset and is thus prepared for the next hot-plug in action. Fig 7c shows waveforms for voltage signal at terminal T3, gate signal of the first transistor, the current across the first inductance L1 and the output current of the driver, wherein the waveforms of the current across the first inductance L1 and output current of the driver are overlapped in most part but the beginning part.

In step 6, after the first inductance L1 and the first capacitor C1 is fully reset, the first transistor Q1 turns on again by the voltage from the terminal T3 through the first resistor R1. Fig. 8a shows a schematic diagram regarding the step 6, and Fig. 8b shows waveforms for voltage signal of the first capacitor, the gate signal of the first transistor, the current across the first inductance and the output current of

the driver, wherein the waveforms of the current across the first inductance L1 and output current of the driver are overlapped in most part.

5 In step 7, the output voltage of the driver increases to an open load voltage, and the LED is fully separated from the driver, and the driver is prepared for next hot-plug in action. As shown in Fig. 9a, LED is disconnected with the driver. Fig 9b shows waveforms for the voltage at terminal T3, gate signal of the first transistor Q1, current across the
10 first inductance and the output current of the driver, wherein the waveforms of the current across the first inductance L1 and output current of the driver are overlapped in most part.

The above are merely preferred embodiments of the present invention but not to limit the present invention. It would be
15 understood by those skilled in the art that the present invention may have various alterations and changes. Any alterations, equivalent substitutions, and improvements, within the spirit and principle of the present invention, should be
20 covered in the scope of the present invention.

Reference Numerals

	1	detection unit
	11	buffer unit
	12	hot plug detection unit
5	2	impedance adjusting unit
	21	impedance conversion unit
	22	conversion drive unit
	221	high impedance drive unit
	222	low impedance drive unit
10	211	high impedance unit
	212	low impedance unit
	100	hot plug module
	200	illuminating device
	L	light emitting unit
15	Q1	first transistor
	Q2	second transistor
	R1	first resistor
	R2	second resistor
	R3	third resistor
20	D1	first zener diode
	D2	second diode
	D3	third diode
	C1	first capacitor
	L1	first inductance
25		

Claims

1. A hot plug module (100) for an illuminating device (200), characterized in comprising:

5 a detection unit (1) for detecting a hot plug state to obtain a detecting state; and

an impedance adjusting unit (2) for adjusting an impedance state of the hot plug module (100) in accordance with the detecting state,

10 and wherein the impedance adjusting unit (2) comprises an impedance conversion unit (21) whose impedance can be converted; and

a conversion drive unit (22) converting the impedance of the impedance conversion unit (21) in accordance with the detecting state to adjust the impedance state.

2. The hot plug module (100) according to claim 1, characterized in that

20 the conversion drive unit (22) comprises:

a high impedance drive unit (221) configured so that the impedance conversion unit (21) is adjusted to be in high impedance; and

25 a low impedance drive unit (222) configured so that the impedance conversion unit (21) is adjusted to be in low impedance.

3. The hot plug module (100) according to claim 1, characterized in that

30 the detecting state comprises a first state characterizing no load, a second state characterizing hot plug-in, and a third state characterizing hot plug-out.

4. The hot plug module (100) according to claim 3, characterized in that

35 the impedance conversion unit (21) comprises:

a high impedance unit (211) activated by the conversion drive unit (22) in accordance with the second state and

the third state; and

a low impedance unit (212) activated by the conversion drive unit (22) in accordance with the first state and the second state, and sequentially deactivated and activated
5 in accordance with the third state.

5. The hot plug module (100) according to claim 1, characterized in that

the detection unit (1) comprises:

10 a buffer unit (11) connected to a light emitting unit (L); and

a hot plug detection unit (12) controlling the conversion drive unit (22) based on a signal supplied by the buffer unit (11) to adjust the impedance conversion unit
15 (21).

6. The hot plug module (100) according to claim 4, characterized in that the high impedance unit (211) comprises at least one electronic device with high impedance.

20

7. The hot plug module (100) according to claim 6, characterized in that the electronic device is configured as any one of an NTC resistor, a PTC resistor and a semiconductor device.

25

8. The hot plug module (100) according to claim 4, characterized in that the low impedance unit (212) comprises at least one controllable switching device (Q1).

30 9. The hot plug module (100) according to claim 8, characterized in that the controllable switching device (Q1) is configured as any one of a power MOSFET, a bipolar transistor and an IGBT.

35 10. The hot plug module (100) according to claim 2, characterized in that

the high impedance drive unit (221) comprises a second transistor (Q2), a second resistor (R2) and a third resis-

tor (R3),

wherein the second transistor (Q2) has a control electrode connected between the second resistor (R2) and the third resistor (R3), and a reference electrode connected to ground.

11. The hot plug module (100) according to claim 10, characterized in that

the low impedance drive unit (222) comprises a first resistor (R1) and a first Zener diode (D1),

wherein the first resistor (R1) is grounded through the first Zener diode (D1), and the second transistor (Q2) has an operational electrode connected between the first resistor (R1) and the first Zener diode (D1).

12. The hot plug module (100) according to claim 5, characterized in that

the hot plug detection unit (12) comprises a third diode (D3) and/or a first capacitor (C1),

wherein the third diode (D3) and/or the first capacitor (C1) is grounded through the conversion drive unit (22).

13. The hot plug module (100) according to claim 12, characterized in that

the hot plug detection unit (12) further comprises a second diode (D2),

wherein a cathode of the third diode (D3) is connected to a cathode of the second diode (D2) and grounded through the second diode (D2).

14. The hot plug module (100) according to claim 5, characterized in that

the buffer unit (11) comprises a first inductance (L1),

wherein the first inductance (L1) is grounded through a controllable switching device (Q1).

15. A driver (201) for an illuminating device (200), characterized in comprising a hot plug module (100) according to

any one of claims 1 to 14.

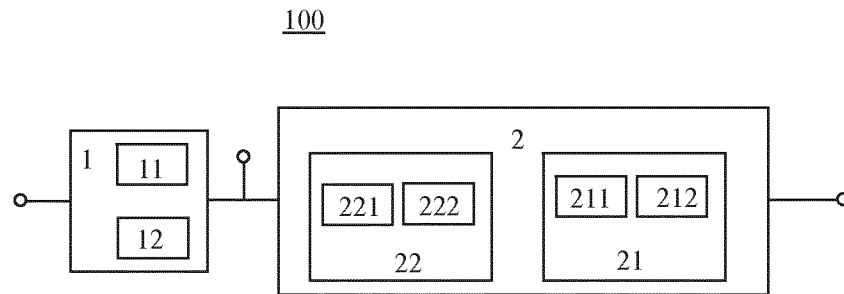
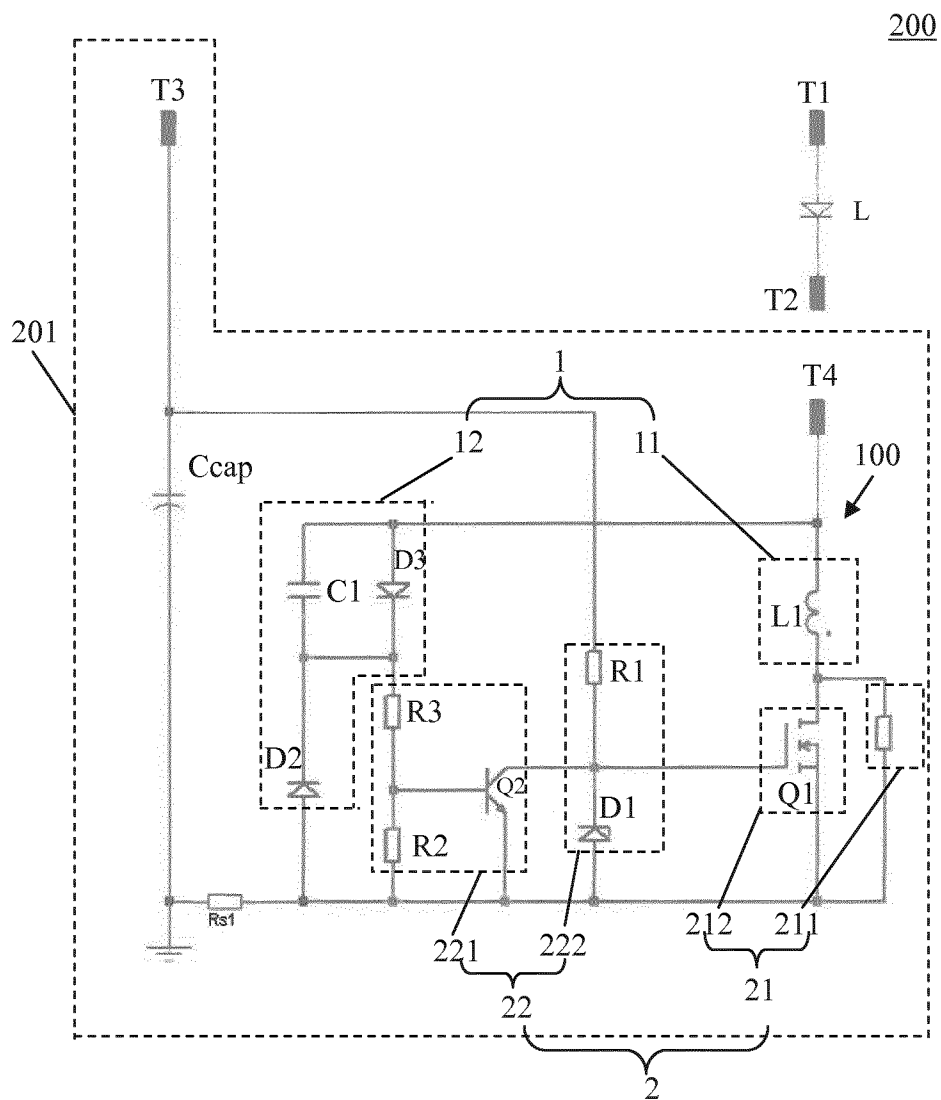
16. The driver (201) according to claim 15, characterized in that

5 the driver (201) further comprises a first detection resistor (Rs1) and an output capacitor (Ccap),
 wherein each of the first detection resistor (Rs1) and the output capacitor (Ccap) has an end connected to ground.

10

17. An illuminating device (200), characterized in comprising:

 at least one light emitting unit (L), and
 a hot plug module (100) according to any one of claims
15 1 to 14 and/or a driver (201) according to any one of
 claims 15 and 16.

**Figure 1****Figure 2**

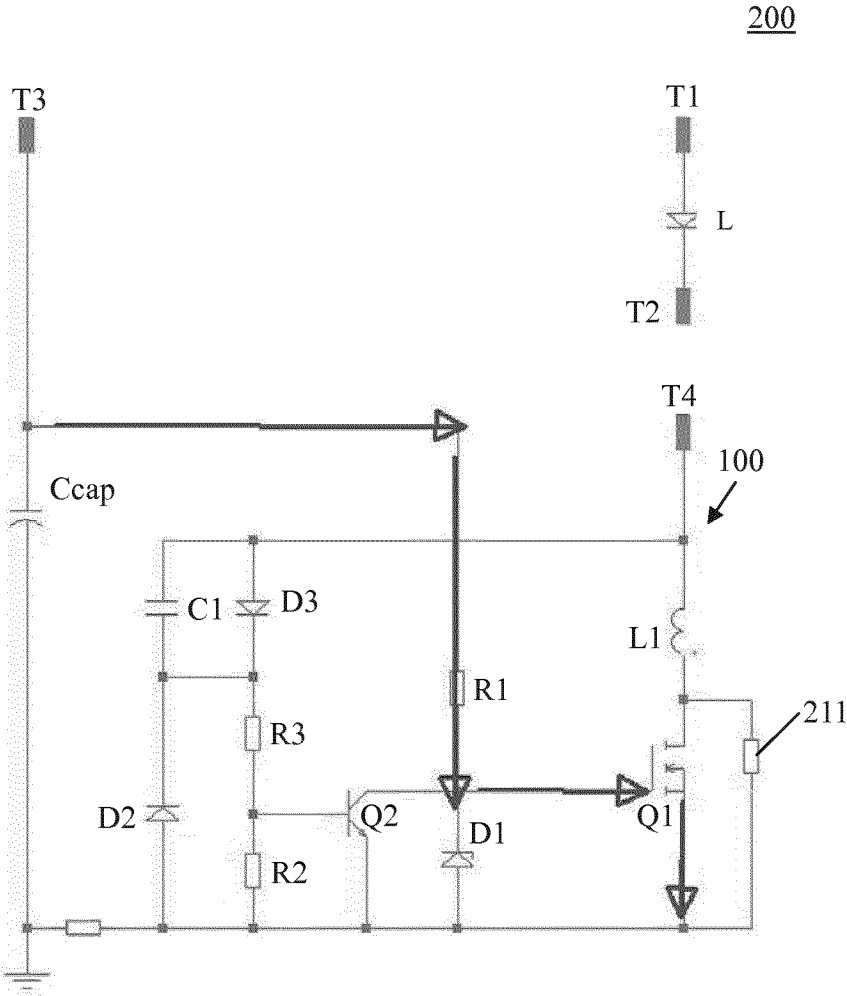
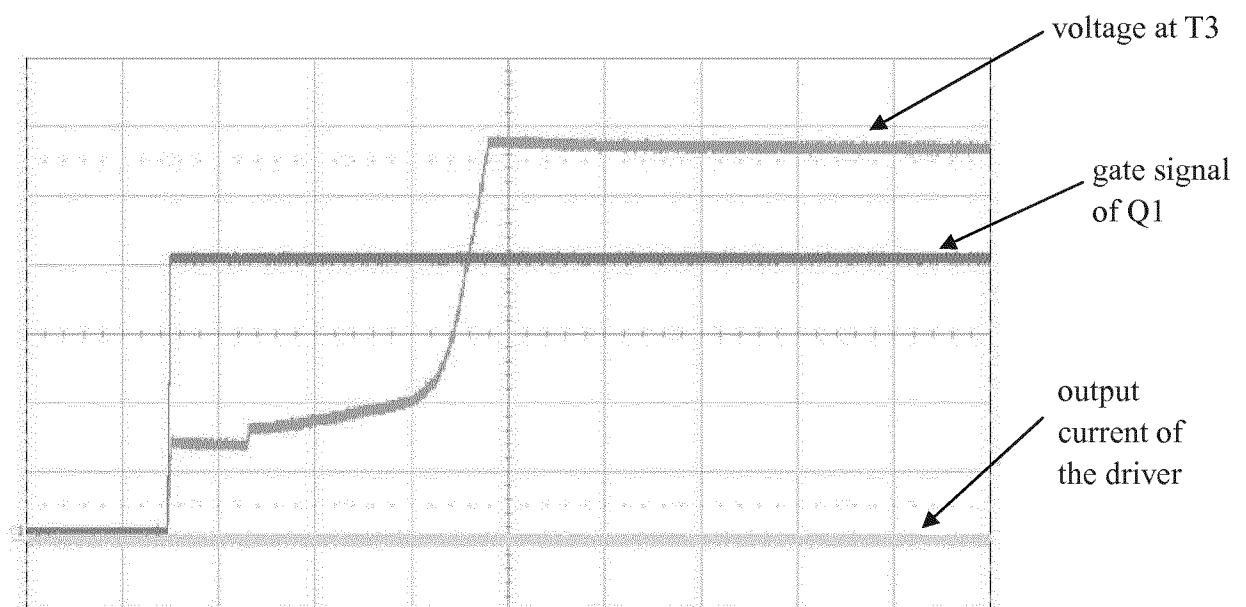


Figure 3a

**Figure 3b**

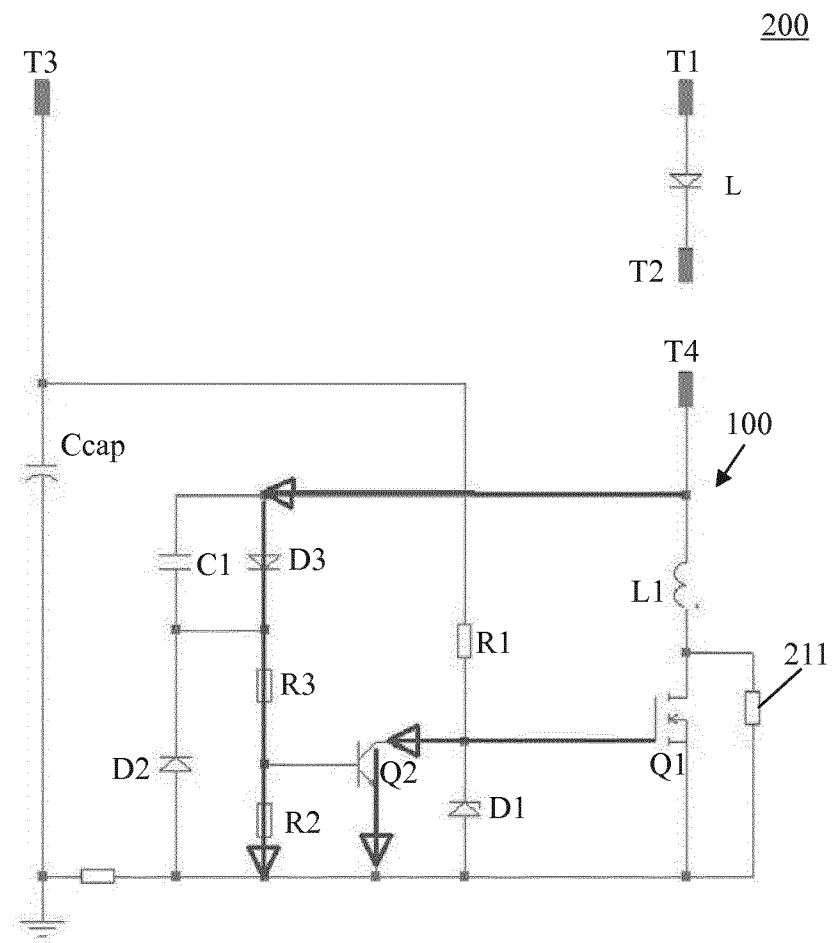
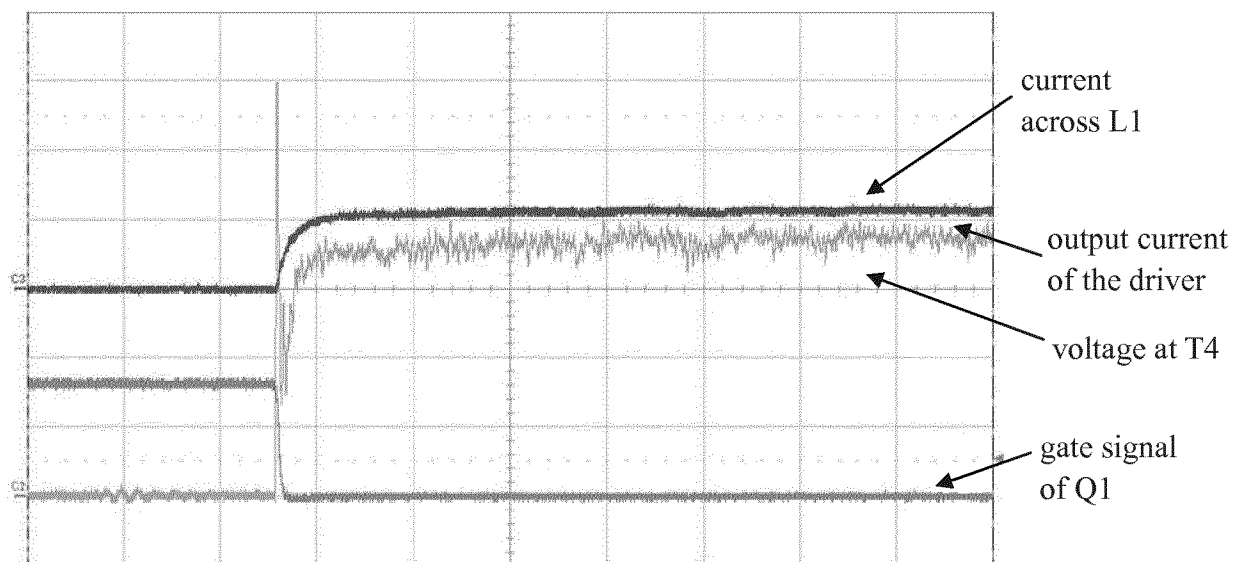


Figure 4a

**Figure 4b**

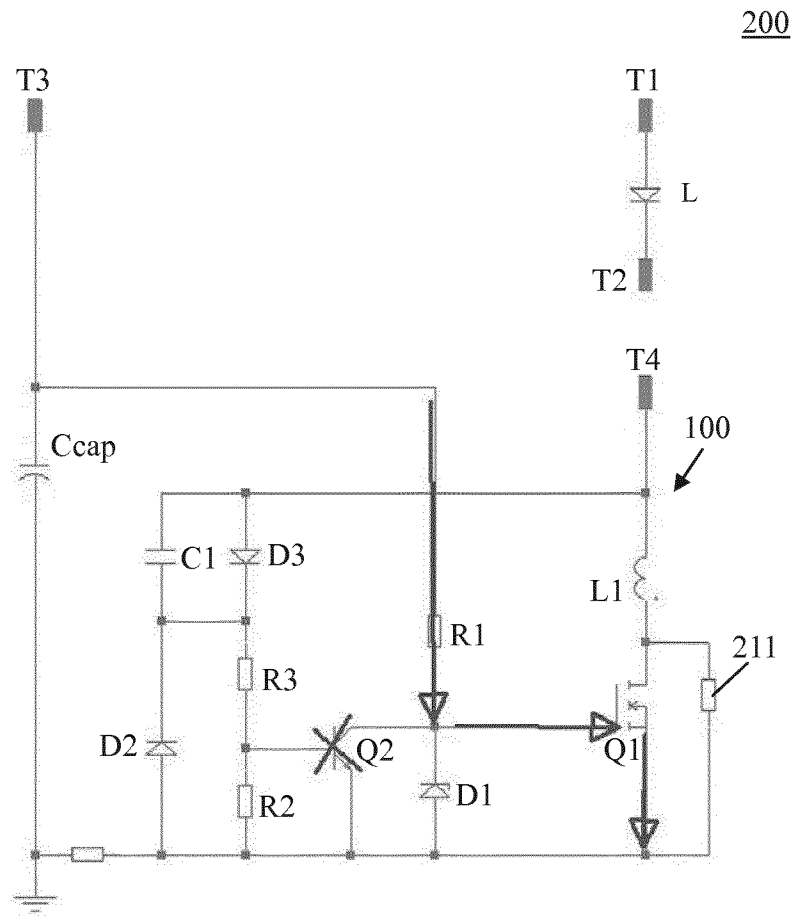
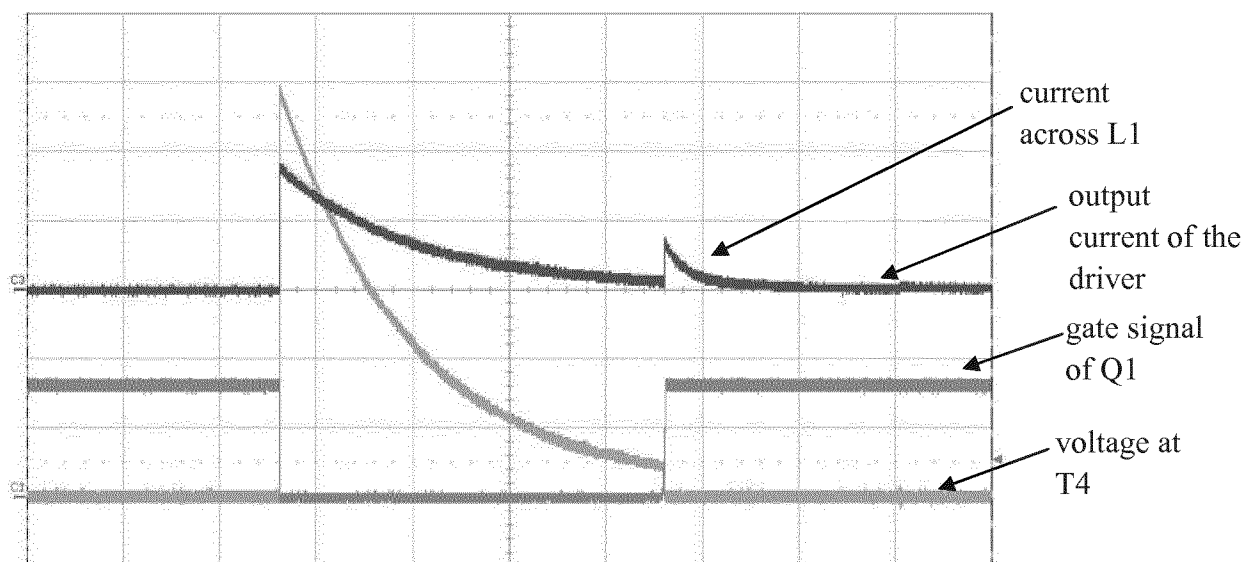


Figure 5a

**Figure 5b**

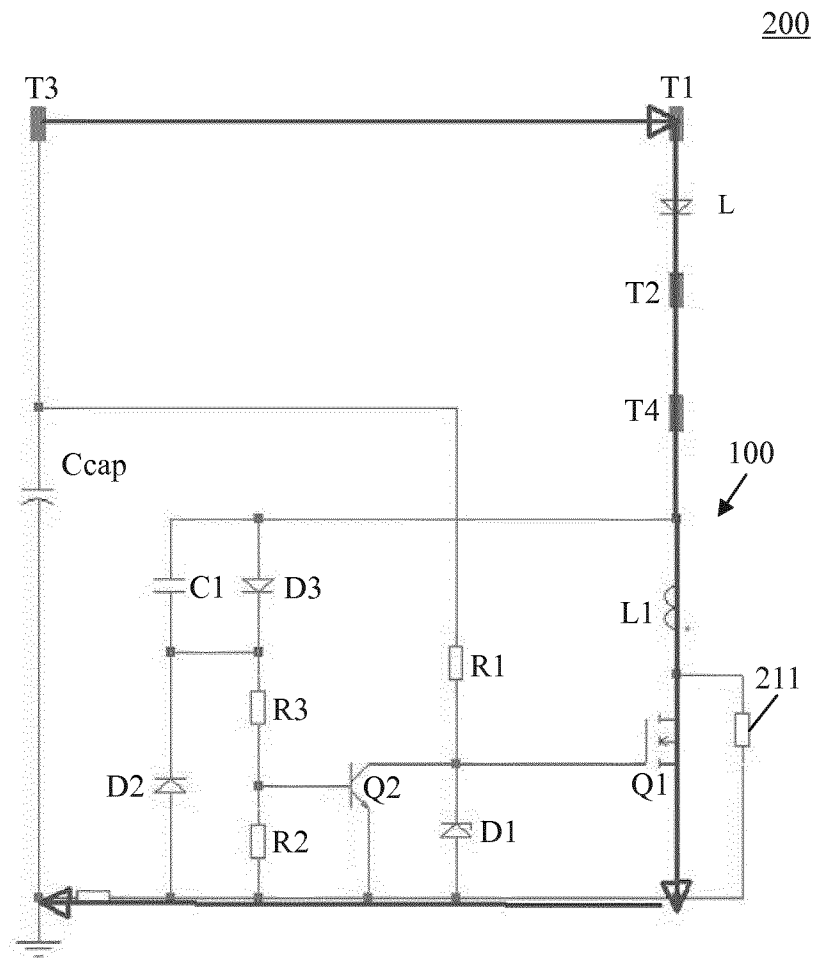
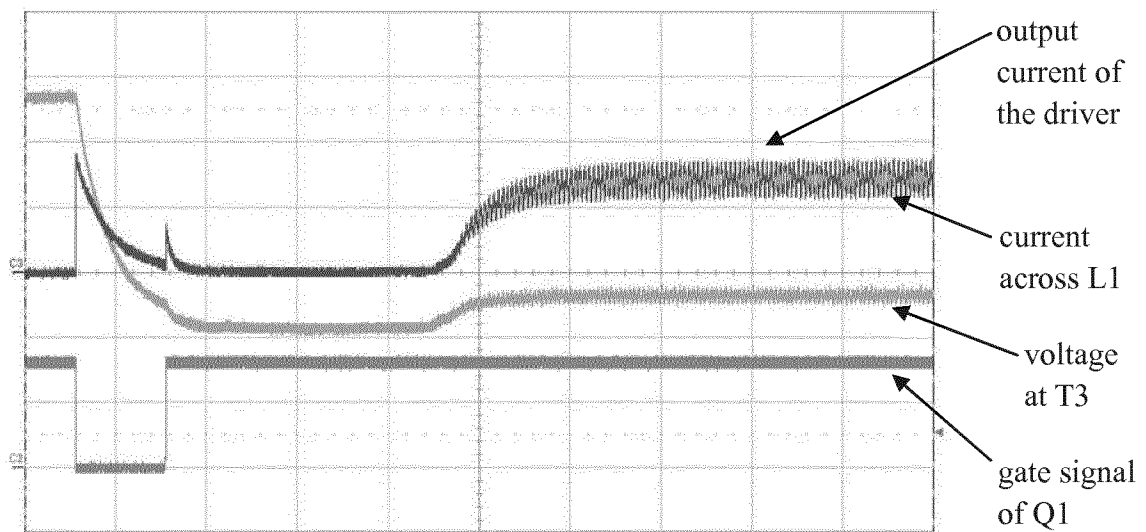


Figure 6a

**Figure 6b**

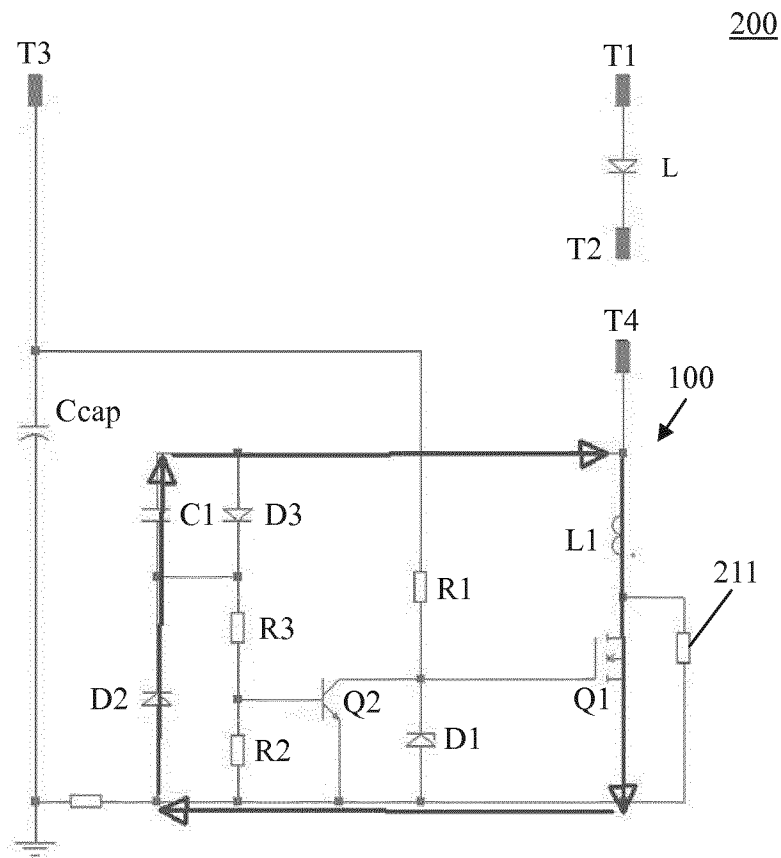


Figure 7a

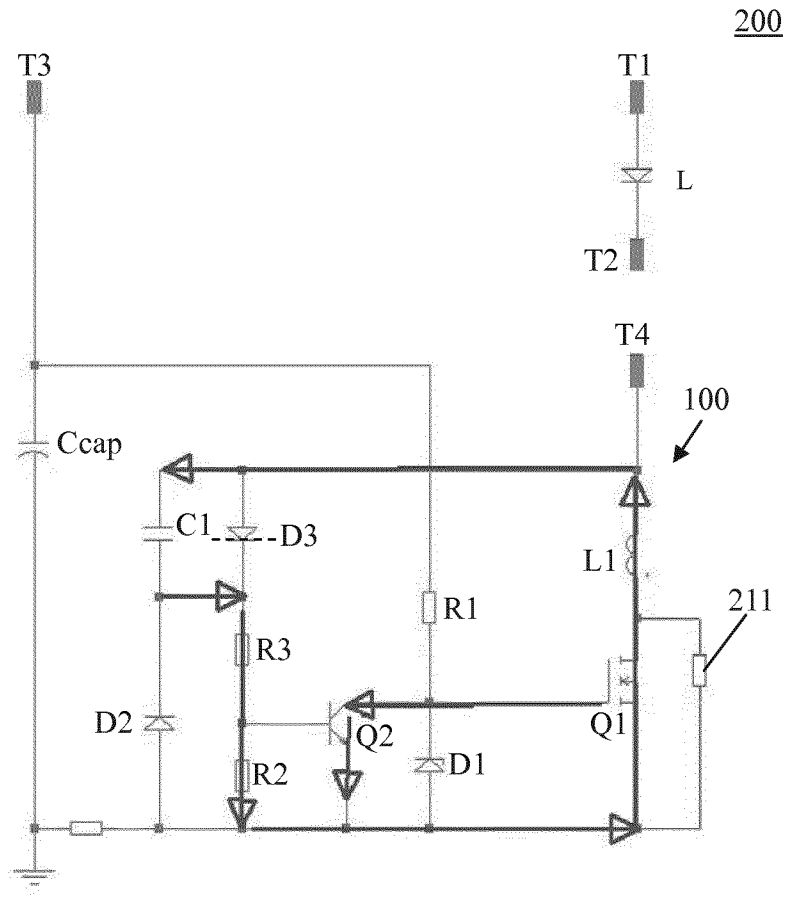
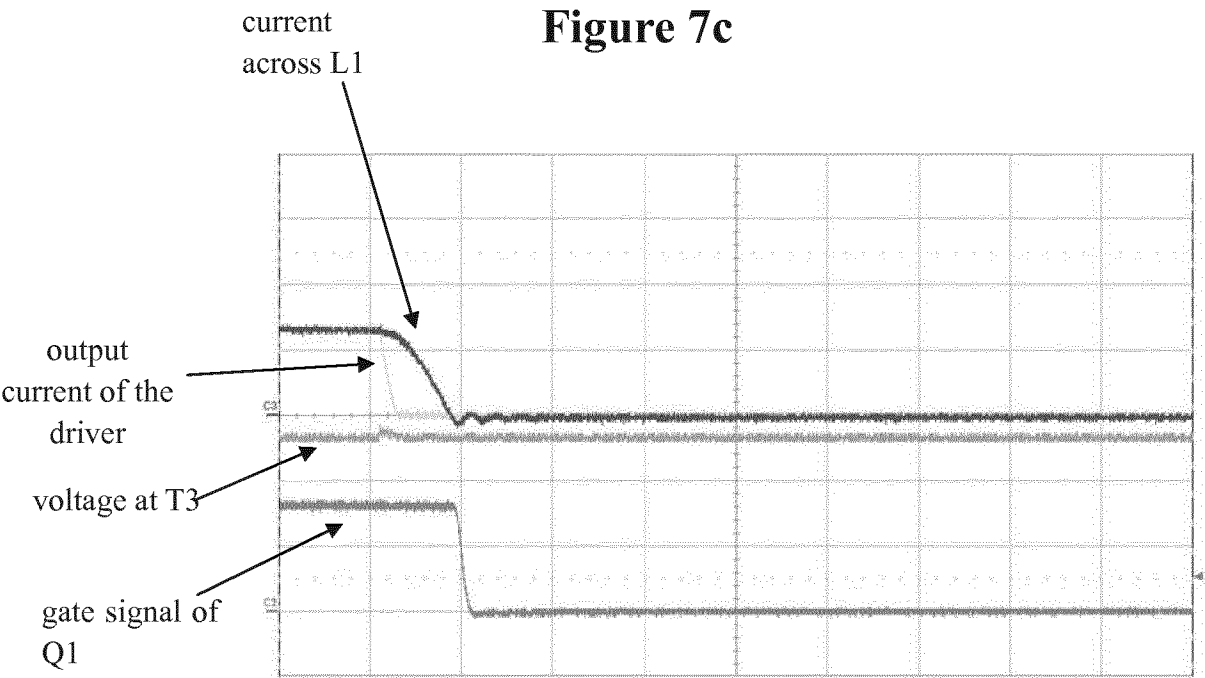


Figure 7b

Figure 7c



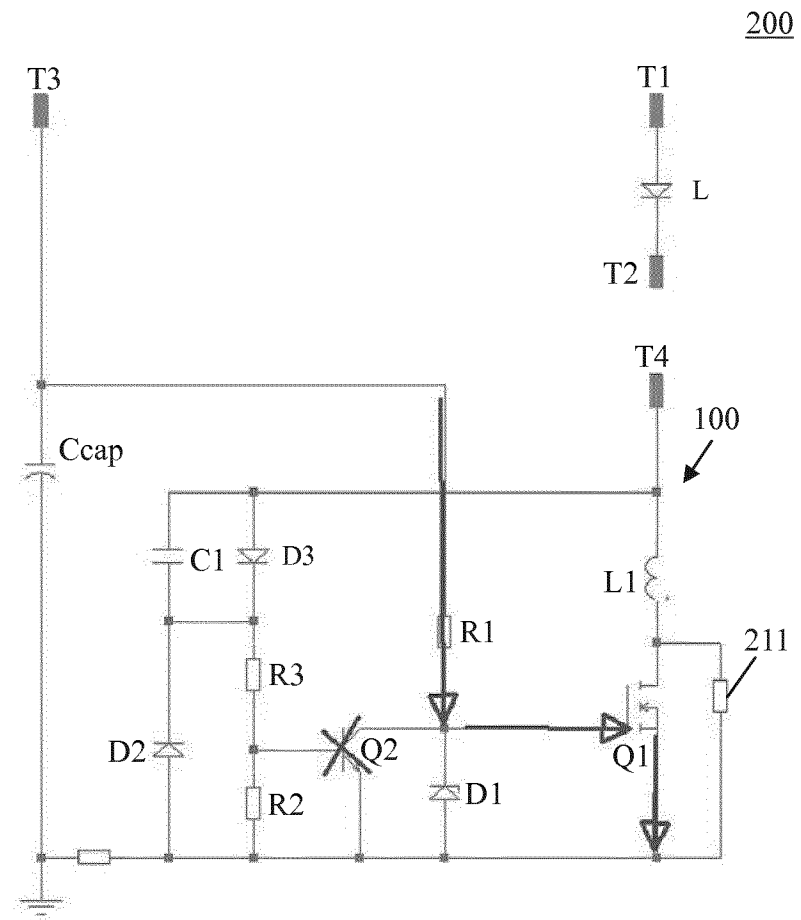
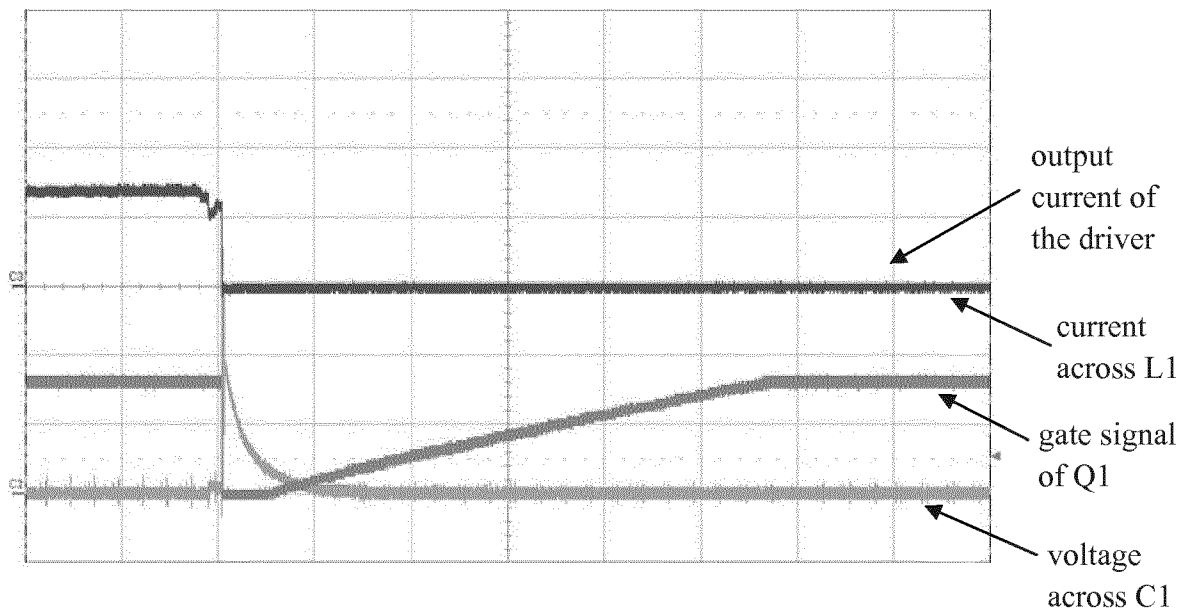


Figure 8a

**Figure 8b**

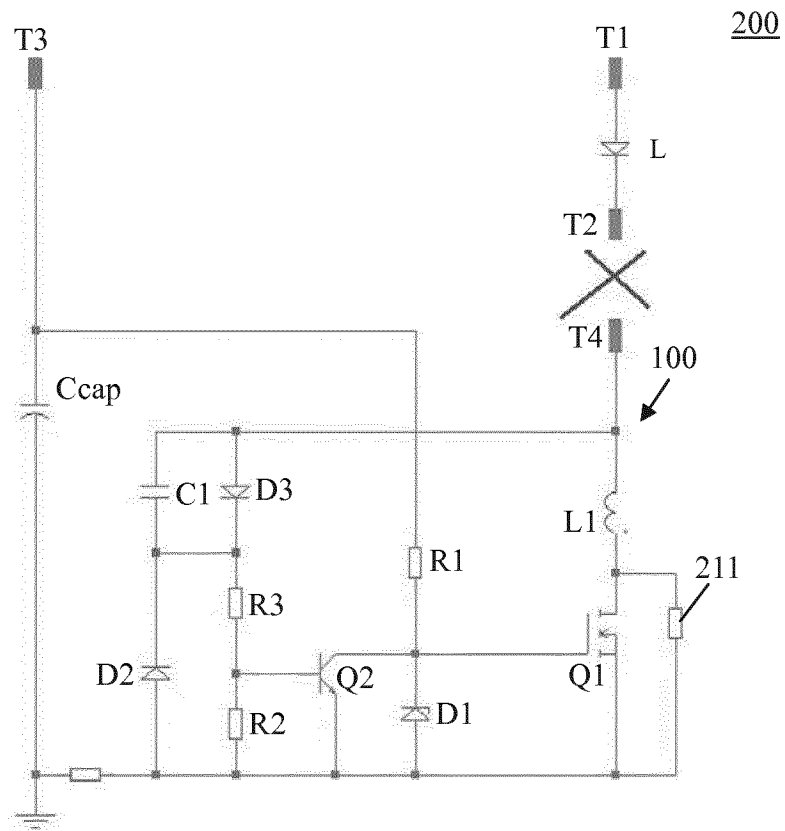
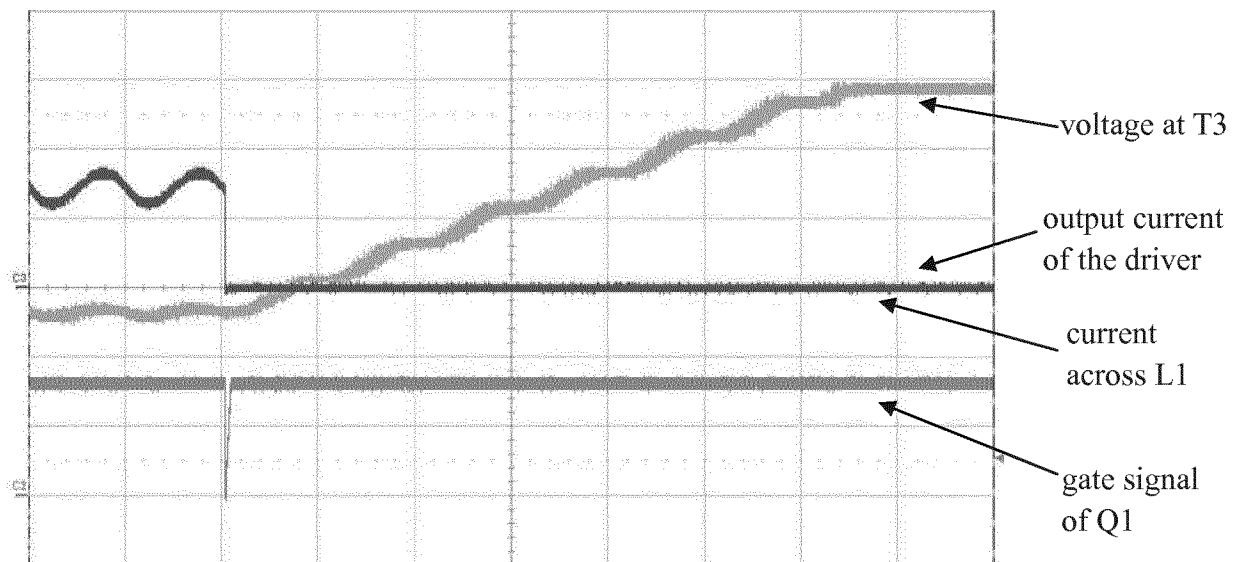


Figure 9a

**Figure 9b**

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2014/066879

A. CLASSIFICATION OF SUBJECT MATTER

INV. H05B33/08

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)

H05B B60Q B64F H04B H04Q

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 practicable, search terms used)

EPO-Internal, WPI Data, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/027962 A2 (ORZIV DESIGN AND DEV [IL]; ZIV AMICHAH [IL]) 5 March 2009 (2009-03-05)	1-3,5, 15-17
A	abstract; figures 1, 2, 4 page 3, paragraph 1 page 3, paragraph 3 - page 6, paragraph 1 page 8, paragraph 1 - page 12, paragraph 3 -----	4,6-14
X	EP 1 830 607 A1 (ACTIA UK LTD [GB]) 5 September 2007 (2007-09-05)	1-3,5, 15-17
A	column 1, paragraphs 1, 4; figures 1-12 column 1 - column 2, paragraph 6 column 2, paragraph 9 - column 8, paragraph 42 column 13, paragraph 73 - column 14, paragraph 76 ----- -/-	4,6-14



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

4 November 2014

Date of mailing of the international search report

11/11/2014

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2014/066879

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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