

EXHIBIT 1002



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/537,694	11/30/2021	Xianghao Meng	T100303US01

CONFIRMATION NO. 7351

23494
TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, MS 3999
DALLAS, TX 75265

PUBLICATION NOTICE



OC000000057739596

Date Mailed: 06/02/2023

Title: LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

Publication No. US-2023-0171864-A1

Publication Date: 06/01/2023

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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APPLICATION NO.	ISSUE DATE	PATENT NO.
17/537,694	16-MAY-23	11653432

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EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at <https://patentcenter.uspto.gov>

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit <https://www.uspto.gov/electronicgrants>



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/537,694	05/16/2023	11653432	T100303US01	7351

23494 759 4/26/2023

TEXAS INSTRUMENTS INCORPORATED
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DALLAS, TX 75265

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at <https://patentcenter.uspto.gov/>. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at <https://certifiedcopycenter.uspto.gov/index.html>. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Xianghao Meng, SHANGHAI, CHINA;
Shangquan Liang, SHANGHAI, CHINA;

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

TEXAS INSTRUMENTS INCORPORATED, Dallas, TX

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/537,694	11/30/2021	Xianghao Meng	T100303US01	7351
23494 7590 04/13/2023 TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, MS 3999 DALLAS, TX 75265			EXAMINER VU, JIMMY T	
			ART UNIT 2844	PAPER NUMBER
			NOTIFICATION DATE 04/13/2023	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspto@ti.com

Response to Rule 312 Communication	Application No. 17/537,694	Applicant(s) Meng et al.	
	Examiner JIMMY T VU	Art Unit 2844	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. ☒ The amendment filed on 28 March 2023 under 37 CFR 1.312 has been considered, and has been:
- a) ☒ entered.
 - b) ☐ entered as directed to matters of form not affecting the scope of the invention.
 - c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.
 - d) ☐ disapproved. See explanation below.
 - e) ☐ entered in part. See explanation below.
 - f) ☐ not entered because the supplemental or corrected Application Data sheet (ADS)
 - ☐ was not accompanied by a petition to accept an unintentionally delayed claim under 37 CFR 1.55 or 27 CFR 1.78;
 - ☐ did not identify the information being changed in accordance with 37 CFR 1.76(c)(2);
 - ☐ was not properly signed in accordance with 37 CFR 1.76(e) (or 37 CFR 1.33(b) for applications filed prior to September 16, 2012).

The 312 amendment filed on 03/28/2023 has been considered and approved for entering. /JV/

JIMMY T VU/ Primary Examiner, Art Unit 2844	
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Docket No.: T100303US01
Application No.: 17/537,694

Response to NOA dated: January 20, 2023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	17/537,694	Confirmation No.:	7351
Inventor:	Xianghao Meng	Art Unit:	2844
Filing Date:	November 30, 2021	Examiner:	Jimmy T. Vu
Docket No.:	T100303US01	Customer No.:	23494
Title:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

AMENDMENT AFTER NOTICE OF ALLOWANCE (RULE 312)

Mail Stop Issue Fee

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

VIA EFS

DATE SENT: March 28 , 2023

Dear Examiner:

Prior to issuance of a patent for the instant application, please amend the application as follows:

Amendments to the Claims begins on page 2 of this paper.

Remarks begin on page 7 of this paper.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	17/537,694	Confirmation No.:	7351
Inventor:	Xianghao Meng	Art Unit:	2844
Filing Date:	November 30, 2021	Examiner:	Jimmy T. Vu
Docket No.:	T100303US01	Customer No.:	23494
Title:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

AMENDMENT AFTER NOTICE OF ALLOWANCE (RULE 312)

Mail Stop Issue Fee

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

VIA EFS

DATE SENT: March 28 , 2023

Dear Examiner:

Prior to issuance of a patent for the instant application, please amend the application as follows:

Amendments to the Claims begins on page 2 of this paper.

Remarks begin on page7 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. **(Original)** A light-emitting diode (LED) driver system comprising:
 an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and
 an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage, the amplifier output stage comprising a slew-rate controller configured to control a slew-rate of the shunt current, the shunt current provided through a shunt resistor in the second current path and added to the output current to provide a total current through an LED string.
2. **(Original)** The system of claim 1, further comprising:
 a first power transistor configured to conduct the output current in the first current path based on a first transistor input voltage; and
 a second power transistor configured to conduct the shunt current in the second current path based on a second transistor input voltage.
3. **(Original)** The system of claim 2, wherein the amplifier output stage comprises:
 a first control transistor configured to conduct a first control current based on the control voltage to generate the first transistor input voltage; and
 a second control transistor configured to conduct a second control current based on the control voltage to generate the second transistor input voltage.
4. **(Original)** The system of claim 3, wherein the slew-rate controller is configured to conduct an offset current in parallel with the second control current to generate the second transistor input voltage, the offset current increasing at the slew-rate.

5. **(Original)** The system of claim 4, wherein the slew-rate controller comprises:
a charging current generator configured to generate a charging current;
a charging capacitor that is charged by a charging current to generate a charging voltage;
a current mirror configured to conduct the offset current based on the charging voltage.
6. **(Original)** The system of claim 1, wherein the amplifier output stage is configured to increase an amplitude of the shunt current and decrease an amplitude of the output current as the supply voltage increases.
7. **(Original)** The system of claim 1, wherein the slew-rate controller comprises a charging capacitor having a capacitance that defines the slew-rate of the shunt current.
8. **(Original)** The system of claim 7, further comprising a power transistor configured to conduct the shunt current in the second current path based on a transistor input voltage, wherein the charging capacitor is configured to generate a charging voltage to control an amplitude of an offset current via a current mirror, wherein the offset current is configured to control the transistor input voltage.
9. **(Original)** The system of claim 8, wherein the amplifier output stage comprises a control transistor that is controlled by the control voltage, wherein the control transistor is coupled to an input of the power transistor to set an initial amplitude of the transistor input voltage, wherein the offset current is subtracted from the initial amplitude to control the power transistor based on the slew-rate.
10. **(Original)** An integrated circuit (IC) chip comprising the LED driver system of claim 1.
11. **(Original)** A light-emitting diode (LED) system comprising:
an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage, the amplifier output stage comprising a slew-rate controller configured to control a slew-rate of the shunt current;

a shunt resistor in the second current path to conduct the shunt current; and

an LED string arranged at an output of the first current path and the second current path to illuminate in response to a total current comprising a sum of the output current and the shunt current.

12. **(Original)** The system of claim 11, wherein the slew-rate controller comprises a charging capacitor having a capacitance that defines the slew-rate of the shunt current.

13. **(Original)** The system of claim 12, further comprising a power transistor configured to conduct the shunt current in the second current path based on a transistor input voltage, wherein the charging capacitor is configured to generate a charging voltage to control an amplitude of an offset current via a current mirror, wherein the offset current is configured to control the transistor input voltage.

14. **(Original)** The system of claim 13, wherein the amplifier output stage comprises a control transistor that is controlled by the control voltage, wherein the control transistor is coupled to an input of the power transistor to set an initial amplitude of the transistor input voltage, wherein the offset current is subtracted from the initial amplitude to control the power transistor based on the slew-rate.

15. **(Original)** The system of claim 11, further comprising:

a first power transistor configured to conduct the output current in the first current path based on a first transistor input voltage; and

a second power transistor configured to conduct the shunt current in the second current path based on a second transistor input voltage;

wherein the amplifier output stage comprises:

a first control transistor configured to conduct a first control current based on the control voltage to generate the first transistor input voltage; and

a second control transistor configured to conduct a second control current based on the control voltage to generate the second transistor input voltage, wherein the slew-rate controller is configured to conduct an offset current in parallel with the second control current to generate the second transistor input voltage, the offset current increasing at the slew-rate.

16. **(Currently Amended)** A light-emitting diode (LED) driver system comprising:

a first power transistor comprising an input and an output coupled to ~~receive~~ an LED string and a shunt resistor;

a second power transistor comprising an input and an output coupled to ~~receive~~ the shunt resistor;

an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage; and

an amplifier output stage comprising an input coupled to the output of the error amplifier, a first output coupled to the input of the first power transistor, and a second output coupled to the input of the second power transistor, the amplifier output stage comprising a slew-rate controller, the slew-rate controller comprising an output coupled to the input of the second power transistor.

17. **(Original)** The system of claim 16, wherein the amplifier output stage is configured to control an amplitude of an output current through a first current path that includes the LED string and a shunt current through a second current path that includes the shunt resistor based on the control voltage.

18. **(Original)** The system of claim 17, wherein the slew-rate controller comprises a charging capacitor having a capacitance that defines the slew-rate of the shunt current.

19. **(Original)** The system of claim 18, further comprising a power transistor configured to conduct the shunt current in the second current path based on a transistor input voltage, wherein the charging capacitor is configured to generate a charging voltage to control an

amplitude of an offset current via a current mirror, wherein the offset current is configured to control the transistor input voltage.

20. **(Original)** The system of claim 19, wherein the amplifier output stage comprises a control transistor that is controlled by the control voltage, wherein the control transistor is coupled to an input of the power transistor to set an initial amplitude of the transistor input voltage, wherein the offset current is subtracted from the initial amplitude to control the power transistor based on the slew-rate.

REMARKS

Applicant has amended claim 16 for clarity. No new matter has been added by way of this Amendment. Applicant respectfully requests entry of this Amendment pursuant to 37 C.F.R. § 1.312.

Authorization

No fee is believed to be due for this submission. However, the Commissioner is hereby authorized to charge any fees or credit any overpayments related to this Response to Deposit Account No. 20-0668.

Respectfully submitted:

By: /Charles F. Koch/

Charles F. Koch
Reg. No. 58,669

Date: March 28, 2023

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Electronic Patent Application Fee Transmittal

Application Number:	17537694			
Filing Date:	30-Nov-2021			
Title of Invention:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL			
First Named Inventor/Applicant Name:	Xianghao Meng			
Filer:	Charles F. Koch/Shannon Rowland			
Attorney Docket Number:	T100303US01			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
UTILITY APPL ISSUE FEE	1501	1	1200	1200
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1200

Electronic Acknowledgement Receipt

EFS ID:	47752223
Application Number:	17537694
International Application Number:	
Confirmation Number:	7351
Title of Invention:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL
First Named Inventor/Applicant Name:	Xianghao Meng
Customer Number:	23494
Filer:	Charles F. Koch/Shannon Rowland
Filer Authorized By:	Charles F. Koch
Attorney Docket Number:	T100303US01
Receipt Date:	28-MAR-2023
Filing Date:	30-NOV-2021
Time Stamp:	12:18:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 1200
RAM confirmation Number	E20233RC19548778
Deposit Account	200668
Authorized User	Shannon Rowland

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	100303US01_Issue_Fee.pdf	193687	no	1
			1e5c9cdf0b9c49ca6ac8f70e511c907392a0f89f		
Warnings:					
Information:					
2		100303US01_Rule_312_Response.pdf	120708	yes	7
			f02b1cb07b99d7399f5e605677c59f17a263ddc3		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment after Notice of Allowance (Rule 312)		1	1	
	Claims		2	6	
	Applicant Arguments/Remarks Made in an Amendment		7	7	
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	40457	no	2
			3574561fbce978db282dce5e0bcb256a2e569b52		
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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Alexandria, VA 22313-1450

By fax, send to: (571) 273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

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01/20/2023

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(Type or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/537,694	11/30/2021	Xianghao Meng	T100303US01	7351

TITLE OF INVENTION: LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	04/20/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
VU, JIMMY T	2844	315-291000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev. 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Charles F. Koch2 Frank D. Cimino

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

TEXAS INSTRUMENTS INCORPORATED

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

P.O. BOX 655474, M/S 3999
DALLAS, TX 75265

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☒ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account Number 20-0668

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Charles F. Koch/Date March 28, 2023Typed or printed name Charles F. KochRegistration No. 58,669

DECLARATION (37 CFR 1.63) FOR UTILITY APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States Application or PCT international application number 17/537694 filed on 11/30/2021
and which was amended on (MMDDYYYY) _____ (if applicable).

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identify theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: XIANGHAO MENG

Date: 23. Nov. 2022

Signature:



DECLARATION (37 CFR 1.63) FOR UTILITY APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL	
As the below named inventor, I hereby declare that: This declaration ☐ The attached application, or is directed to: ☒ United States Application or PCT international application number <u>17/537694</u> filed on <u>11/30/2021</u> and which was amended on (MMDDYYYY) _____ (if applicable). The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendments specifically referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identify theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.		
LEGAL NAME OF INVENTOR		
Inventor:	SHANGQUAN LIANG	Date <u>23. Nov, 2022</u>
Signature:		

Electronic Acknowledgement Receipt

EFS ID:	47514007
Application Number:	17537694
International Application Number:	
Confirmation Number:	7351
Title of Invention:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL
First Named Inventor/Applicant Name:	Xianghao Meng
Customer Number:	23494
Filer:	Charles F. Koch/Shannon Rowland
Filer Authorized By:	Charles F. Koch
Attorney Docket Number:	T100303US01
Receipt Date:	10-FEB-2023
Filing Date:	30-NOV-2021
Time Stamp:	11:52:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	T100303US01_Signed_Declaration.pdf	1616018	no	2
			e63eda2cd11a5e2f63fd092ffab23605a4d471f4		

Warnings:

Information:	
Total Files Size (in bytes):	1616018
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

23494 7590 01/20/2023
TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, MS 3999
DALLAS, TX 75265

EXAMINER

VU, JIMMY T

ART UNIT

PAPER NUMBER

2844

DATE MAILED: 01/20/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/537,694	11/30/2021	Xianghao Meng	T100303US01	7351

TITLE OF INVENTION: LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	04/20/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

23494 7590 01/20/2023
TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, MS 3999
DALLAS, TX 75265

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/537,694	11/30/2021	Xianghao Meng	T100303US01	7351

TITLE OF INVENTION: LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	04/20/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
VU, JIMMY T	2844	315-291000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/537,694	11/30/2021	Xianghao Meng	T100303US01	7351
EXAMINER				
VU, JIMMY T				
ART UNIT			PAPER NUMBER	
2844				
DATE MAILED: 01/20/2023				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<i>Notice Requiring Inventor's Oath or Declaration</i>	Application No. 17/537,694	Applicant(s) Xianghao Meng	
	Examiner VU, JIMMY T	Art Unit 2844	

This notice is an attachment to the Notice of Allowability (PTOL-37), or the Notice of Allowability For A Design Application (PTOL-37D).

An inventor's oath or declaration in compliance with 37 CFR 1.63 or 1.64 executed by or with respect to each inventor has not yet been submitted.

An oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each inventor (for any inventor for which a compliant oath, declaration, or substitute statement has not yet been submitted) **MUST** be filed no later than the date on which the issue fee is paid. See 35 U.S.C. 115(f). Failure to timely comply will result in ABANDONMENT of this application.

A properly executed inventor's oath to declaration has not been received for the following inventor(s):

If applicant previously filed one or more oaths, declarations, or substitute statements, applicant may have received an informational notice regarding deficiencies therein.

The following deficiencies are noted:

INFORMAL ACTION PROBLEMS

- A properly executed inventor's oath or declaration has not been received for the following inventor(s): **Xianghao Meng** and **Shangquan Liang**.

Applicant may submit the inventor's oath or declaration at any time before the Notice of Allowance and Fee(s) Due, PTOL-85, is mailed.

Questions relating to this Notice should be directed to the Application Assistance Unit at 571-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/537,694	Applicant(s) Meng et al.	
	Examiner JIMMY T VU	Art Unit 2844	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/30/2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-20. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some* c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____ 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____ 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____
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/JIMMY T VU/
Primary Examiner, Art Unit 2844

DETAILED ACTION

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Examiner's Comment

This Office Action is in response to the Applicant's Communication filed on 11/30/2021.

In virtue of the communication:

Claims 1-20 are present in the instant application.

Examiner's Statement of Reasons for Allowance

Claims **1-20** are allowed.

The primary reasons for the allowance of the claims are in the inclusion of the limitation(s):

“... **a** light-emitting diode (LED) driver system comprising: ~~an~~ error amplifier configured to compare ~~an~~ input voltage with **a** reference voltage to generate **a** control voltage; and ~~an~~ amplifier output stage configured to control ~~an~~ output current through **a** first current path and **a** shunt current through **a** second current path based on the control voltage, the amplifier output stage comprising **a** slew-rate controller configured to control **a** slew-rate of the shunt current, the shunt current provided through **a** shunt resistor in the second current path and added to the output current to provide **a** total current through ~~an~~ LED string” and combination thereof, in the claim(s), i.e., claim 1, (claims 2-10 are allowed as being dependent on claim 1),

“... **a** light-emitting diode (LED) system comprising: ~~an~~ error amplifier configured to compare ~~an~~ input voltage with **a** reference voltage to generate **a** control voltage; and ~~an~~

Art Unit: 2844

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage, the amplifier output stage comprising a slew-rate controller configured to control a slew-rate of the shunt current; a shunt resistor in the second current path to conduct the shunt current; and an LED string arranged at an output of the first current path and the second current path to illuminate in response to a total current comprising a sum of the output current and the shunt current” and combination thereof, in the claim(s), i.e., claim 11, (claims 12-15 are allowed as being dependent on claim 11), and

“... a light-emitting diode (LED) driver system comprising: a first power transistor comprising an input and an output coupled to receive an LED string and a shunt resistor; a second power transistor comprising an input and an output coupled to receive the shunt resistor; an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage; and an amplifier output stage comprising an input coupled to the output of the error amplifier, a first output coupled to the input of the first power transistor, and a second output coupled to the input of the second power transistor, the amplifier output stage comprising a slew-rate controller, the slew-rate controller comprising an output coupled to the input of the second power transistor” and combination thereof, in the claim(s), i.e., claim 16, (claims 17-20 are allowed as being dependent on claim 16), which are not found in the prior art references.

The prior art made of record and relied upon is considered pertinent to applicant's disclosure. The best consider with this application can be filed in Cleveland (U.S. Patent 9,882,497 B2) and Elo (U.S. Pub. 2017/0359866 A1).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JIMMY T VU whose telephone number is (571) 272-1832. The examiner can normally be reached on 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander H. Taningco can be reached on (571) 272-8048. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2800.

/JIMMY T VU/
Primary Examiner, Art Unit 2844

Notice of References Cited	Application/Control No. 17/537,694	Applicant(s)/Patent Under Reexamination Meng et al.	
	Examiner JIMMY T VU	Art Unit 2844	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20170359866-A1	12-2017	Elo; Peter Mikael	H05B45/48	1/1
*	B	US-9882497-B2	01-2018	Cleveland; Terry L.	H05B45/382	1/1
	C					
	D					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification 	Application/Control No. 17/537,694	Applicant(s)/Patent Under Reexamination Meng et al.
	Examiner JIMMY T VU	Art Unit 2844

CPC						
Symbol					Type	Version
H05B	/	45	/	48	F	2020-01-01
H05B	/	45	/	34	I	2020-01-01
H05B	/	45	/	345	I	2020-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version
/				

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/JIMMY T VU/ Primary Examiner, Art Unit 2844 (Primary Examiner) _____ (Date) _____		31 December 2022 O.G. Print Claim(s) 1	O.G. Print Figure 2

<i>Issue Classification</i> 	Application/Control No. 17/537,694	Applicant(s)/Patent Under Reexamination Meng et al.
	Examiner JIMMY T VU	Art Unit 2844

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H05B	/	45	/ 34
H05B	/	45	/ 48
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/JIMMY T VU/ Primary Examiner, Art Unit 2844 (Primary Examiner)	31 December 2022 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 2

Issue Classification 	Application/Control No. 17/537,694	Applicant(s)/Patent Under Reexamination Meng et al.
	Examiner JIMMY T VU	Art Unit 2844

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47
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CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10		19										
	2		11		20										
	3		12												
	4		13												
	5		14												
	6		15												
	7		16												
	8		17												
	9		18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/JIMMY T VU/ Primary Examiner, Art Unit 2844 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 1	O.G. Print Figure 2

Search Notes 	Application/Control No. 17/537,694	Applicant(s)/Patent Under Reexamination Meng et al.
	Examiner JIMMY T VU	Art Unit 2844

CPC - Searched*		
Symbol	Date	Examiner
H05B45/30 H05B45/34 H05B45/345 H05B45/48 H05B47/10	12/31/2022	JV

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
CPC, Text, Assignment data, Inventor name, & Back/Forward search (PE2E)	12/31/2022	JV

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H05B	45/34	12/31/2022	JV
H05B	45/48	12/31/2022	JV
USPAT, US-PGPUB	interference search	12/31/2022	JV

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<i>Index of Claims</i> 	Application/Control No. 17/537,694	Applicant(s)/Patent Under Reexamination Meng et al.
	Examiner JIMMY T VU	Art Unit 2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM			DATE							
Final	Original	12/31/2022								
	1	=								
	2	=								
	3	=								
	4	=								
	5	=								
	6	=								
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	10	=								
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	14	=								
	15	=								
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	17	=								
	18	=								
	19	=								
	20	=								

Bibliographic Data

Application No: 17/537,694

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

/JIMMY T VU/

Examiner's Signature

/JV/

Initials

Title:

LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/30/2021	315	2844	T100303US01
RULE			

APPLICANTS

TEXAS INSTRUMENTS INCORPORATED, Dallas, TX, UNITED STATES

INVENTORS

Xianghao Meng, SHANGHAI, CHINA

Shangquan Liang, SHANGHAI, CHINA

CONTINUING DATA

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

12/09/2021

STATE OR COUNTRY

CHINA

ADDRESS

TEXAS INSTRUMENTS INCORPORATED

P O BOX 655474, MS 3999

DALLAS, TX 75265

UNITED STATES

FILING FEE RECEIVED

\$1,980

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	0	17/537694	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:18 PM
L2	18180	((light\$3 near5 emit\$4) LED\$1) AND (error WITH amplif\$4 WITH control\$4 WITH voltage)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:20 PM
L3	98	2 AND (slew WITH rate WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:21 PM
L4	7	3 AND (shunt WITH resist\$4)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:21 PM
L5	6	4 AND @ad <= "20211130"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:22 PM
L6	17094	((light\$3 near5 emit\$4) LED\$1) AND ((transist\$4 switch\$3) WITH shunt\$3 WITH resist\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:24 PM
L7	7	6 AND (amplif\$4 WITH (slew\$3 near3 rate) WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2022/12/31 09:25 PM

L8	271	6 AND (error WITH amplif\$4) AND ((slew\$3- rate) WITH control\$4)	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:27 PM
L9	11	8 AND (H05B45/30 H05B45/34 H05B45/345 H05B45/48 H05B47/10).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:30 PM
L10	7040167	((transist\$4 switch\$3) WITH first WITH second)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:33 PM
L11	400903	((transist\$4 switch\$3) WITH first WITH second WITH amplif\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:33 PM
L12	13943	11 AND (shunt\$3 WITH resist\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:34 PM
L13	183	12 AND ((slew\$3 near3 rate) WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:34 PM
L14	18	13 AND (H05B45/30 H05B45/34 H05B45/345 H05B45/4	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2022/12/31 09:34 PM

L15	18	8 H05B47/10).cpc. 14 AND @ad <= "20211130"	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:35 PM
L16	375	("3746918" "3832503" "3909670" "3958885" "3974637" "4082395" "4298869" "4329625" "4367464" "4388567" "4388589" "4420711" "4625152" "4647217" "4656398" "4687340" "4688154" "4705406" "4707141" "4727289" "4771274" "4780621" "4818072" "4845481" "4845745" "4877034" "4884133" "4887074" "4898175" "4930504" "4965561" "5007408" "5008595" "5024236" "5083063" "5128595" "5282121" "5294865" "5350977" "5353786" "5357170" "5371618" "5374876" "5634711" "5665100" "5807261" "5963333" "6026323" "6128525" "6139175" "6254264" "6468204" "6626824" "6646541" "6702734" "6821245").pn. OR ("7308296").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/12/31 09:36 PM
L17	0	16 AND ((slew\$3 near3 rate) WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:36 PM
L18	1	16 AND ((transist\$4 switch\$3) WITH first WITH second WITH amplif\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2022/12/31 09:37 PM

L19	78	("6304066" "6720745" "6847169" "7218168" "7308296" "7362131" "7733034" "7919925" "8045066" "8212608" "8362639" "8441382" "8618867" "8710810" "8810153" "8890429" "8890737" "9220139" "9307590" "9392661" "9407268" "9419636" "9450595" "9451664" "9500678" "9531265" "9541933" "9548752" "9660590" "9698806" "9733282" "9735797" "9810723" "9960675" "9970994" "9979385" "10003349" "10048714" "10248150" "10284215" "20020125872" "20060181305" "20070030055" "20070188759" "20080084196" "20100045368" "20100085025" "20100106231" "20100148735" "20100194443" "20100277239" "20110254828" "20120161728" "20120268026" "20120280667" "20130049611" "20130221940" "20130271095" "20140055110" "20140070876" "20140152362" "20140266832" "20150069995" "20160066371" "20170030947" "20170033688" "20170070149" "20170127488" "20170237345" "20170272089" "20170316834" "20180248558"	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/12/31 09:37 PM
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L20	3	"20180259988" "20180348806" "20190025865" "20190140632" "20190208589" "20200127564").pn. OR ("11043897").urpn. AND (PGPB USPT USOC).dbnm. 19 AND ((slew\$3 near3 rate) WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:37 PM
L21	446440	((light\$3 near5 emit\$4) LED\$1) SAME ((transist\$4 switch\$3) WITH first WITH second)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:39 PM
L22	77	21 AND (amplif\$4 WITH (slew\$3 near3 rate) WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:39 PM
L23	9	22 AND (H05B45/30 H05B45/34 H05B45/345 H05B45/4 8 H05B47/10).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:40 PM
L24	6	("8008953" "8884866" "20080133802" "20090307381" "20130127924").pn. OR ("9713218").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/12/31 09:54 PM
L25	5899	((light\$3 near5 emit\$4) LED\$1) SAME ((transist\$4 switch\$3) WITH shunt\$3 WITH resist\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:55 PM

L26	167	((light\$3 near5 emit\$4) LED\$1) SAME ((transist\$4 switch\$3) WITH shunt\$3 WITH resist\$4) SAME (error near5 amplif\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:56 PM
L27	0	((light\$3 near5 emit\$4) LED\$1) SAME ((transist\$4 switch\$3) WITH shunt\$3 WITH resist\$4) SAME (error near5 amplif\$4) SAME (slew\$3 near3 rate)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:56 PM
L28	33	26 AND (H05B45/30 H05B45/34 H05B45/345 H05B45/4 8 H05B47/10).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:56 PM
L29	33	28 AND @ad <= "20211130"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 09:57 PM
L30	8	((light\$3 LED\$1) AND ((slew\$3 near3 rate) WITH control\$4)).ti.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 10:00 PM
L31	2	26 AND (slew\$3 near3 rate)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 10:02 PM
L32	27259	((("TEXAS") near3 ("INSTRUMENTS") near3 ("INCORPORATED")))). AS,AANM.	(USPAT)	OR	ON	ON	2022/12/31 10:03 PM
L33	68	32 AND (light\$3 LED\$1) AND ((slew\$3 near3 rate) WITH control\$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2022/12/31 10:04 PM

L34	9	33 AND ((transist\$4 switch\$3) WITH first WITH second WITH amplif\$4)	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/12/31 10:04 PM
L35	2	((("MENG") near3 ("Xianghao")) OR (("LIANG") near3 ("Shangquan"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/12/31 10:06 PM
L36	95	((light\$3 LED\$1) AND ((slew\$3 near3 rate) WITH control\$4)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/31 10:28 PM
L37	0	((light\$3 LED\$1) AND ((slew\$3 near3 rate) WITH control\$4) AND ((transist\$4 switch\$3) WITH shunt\$3 WITH resist\$4)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/31 10:30 PM
L38	0	((light\$3 LED\$1) AND ((slew\$3 near3 rate) WITH control\$4) AND (shunt\$3 WITH resist\$4)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/31 10:30 PM
L39	161	((light\$3 LED\$1) AND (transist\$4 WITH shunt\$3 WITH resist\$4)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/31 10:31 PM
L40	4	((light\$3 LED\$1) AND (transist\$4 WITH shunt\$3 WITH resist\$4) AND (error near5 amplif\$4)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/31 10:32 PM
L41	35	("5568016" "5991172" "6594161" "6671189" "6788555" "7902771" "8023291" "8067898" "8952632" "9035566" "20030086280" "20050007086" "20050122747" "20050152158" "20050194952" "20050213352" "20050257647" "20060018135" "20060170373" "20070096704"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/12/31 10:32 PM

		"20070159151" "20080018261" "20080088248" "20080180078" "20080224636" "20090296425" "20100110732" "20100283322" "20100301761" "20100308733" "20100315840" "20110057960" "20110193481" "20120025722").pn. OR ("9882497").urpn. AND (PGPB USPT USOC).dbnm.					
L42	1	41 AND (slew\$3 near3 rate)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/31 10:33 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
17/537,694	11/30/2021	2842	1980	T100303US01	20	3

CONFIRMATION NO. 7351

FILING RECEIPT

23494
TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, MS 3999
DALLAS, TX 75265



Date Mailed: 12/10/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Xianghao Meng, SHANGHAI, CHINA;
Shangquan Liang, SHANGHAI, CHINA;

Applicant(s)

TEXAS INSTRUMENTS INCORPORATED, Dallas, TX

Power of Attorney: The patent practitioners associated with Customer Number 23494

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 12/09/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/537,694**

Projected Publication Date: 06/01/2023

Non-Publication Request: No

Early Publication Request: No
Title

LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

Preliminary Class

330

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/537,694	11/30/2021	Xianghao Meng	T100303US01

CONFIRMATION NO. 7351

INFORMAL NOTICE

23494
TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, MS 3999
DALLAS, TX 75265



Date Mailed: 12/10/2021

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Xianghao Meng
Shangquan Liang

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/s/

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
17/537,694

APPLICATION AS FILED - PART I

(Column 1)		(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(j))	20 minus 20 = *	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR	x	=
Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR	x	=
Application Size Fee (37 CFR 1.16(s))						OR		
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR		
				TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR	x	=
Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR	x	=
Application Size Fee (37 CFR 1.16(s))						OR		
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR		
				TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM <i>(to be used for all correspondence after initial filing)</i>	Application Number	17/537694	
	Filing Date	30-Nov-2021	
	First Named Inventor	Xianghao Meng	
	Art Unit	unknown	
	Examiner Name	unknown	
Total Number of Pages in This Submission	1	Attorney Docket Number	T100303US01

ENCLOSURES (Check all that apply)		
☐ Fee Transmittal Form ☐ Fee Attached ☐ Amendment/Reply ☐ After Final ☐ Affidavits/declaration(s) ☐ Extension of Time Request ☐ Express Abandonment Request ☐ Information Disclosure Statement ☐ Certified Copy of Priority Document(s) ☐ Reply to Missing Parts/ Incomplete Application ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53	☒ Drawing(s) ☐ Licensing-related Papers ☐ Petition ☐ Petition to Convert to a Provisional Application ☐ Power of Attorney, Revocation Change of Correspondence Address ☐ Terminal Disclaimer ☐ Request for Refund ☐ CD, Number of CD(s) _____ ☐ Landscape Table on CD Remarks Replacement formal drawings - Figs. 1-5.	☐ After Allowance Communication to TC ☐ Appeal Communication to Board of Appeals and Interferences ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) ☐ Proprietary Information ☐ Status Letter ☐ Other Enclosure(s) (please identify below):

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Tarolli, Sundheim, Covell & Tummino LLP		
Signature	/Christopher P Harris/		
Printed name	Christopher P. Harris		
Date	2021-12-07	Reg. No.	43660

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature	/Lisa L Pringle/		
Typed or printed name	Lisa L. Pringle	Date	2021-12-07

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

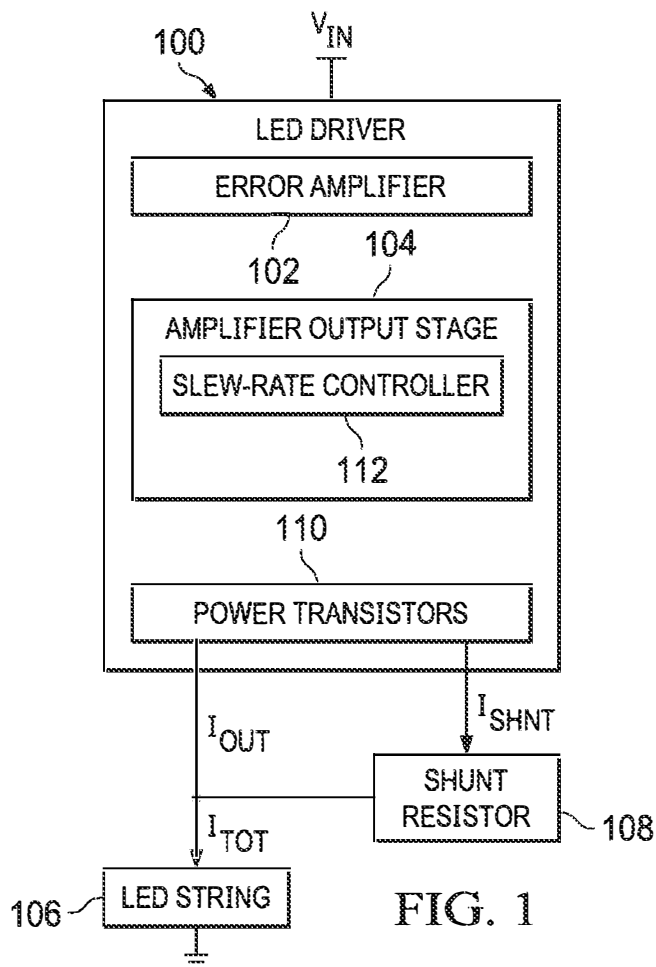
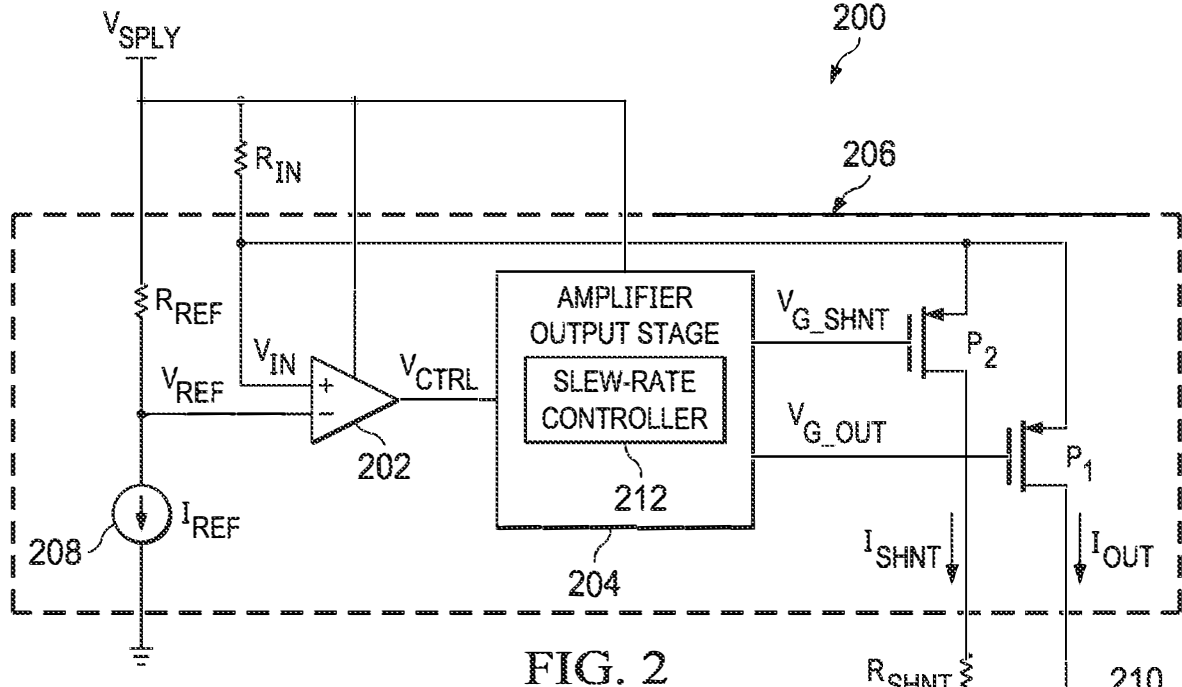
Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

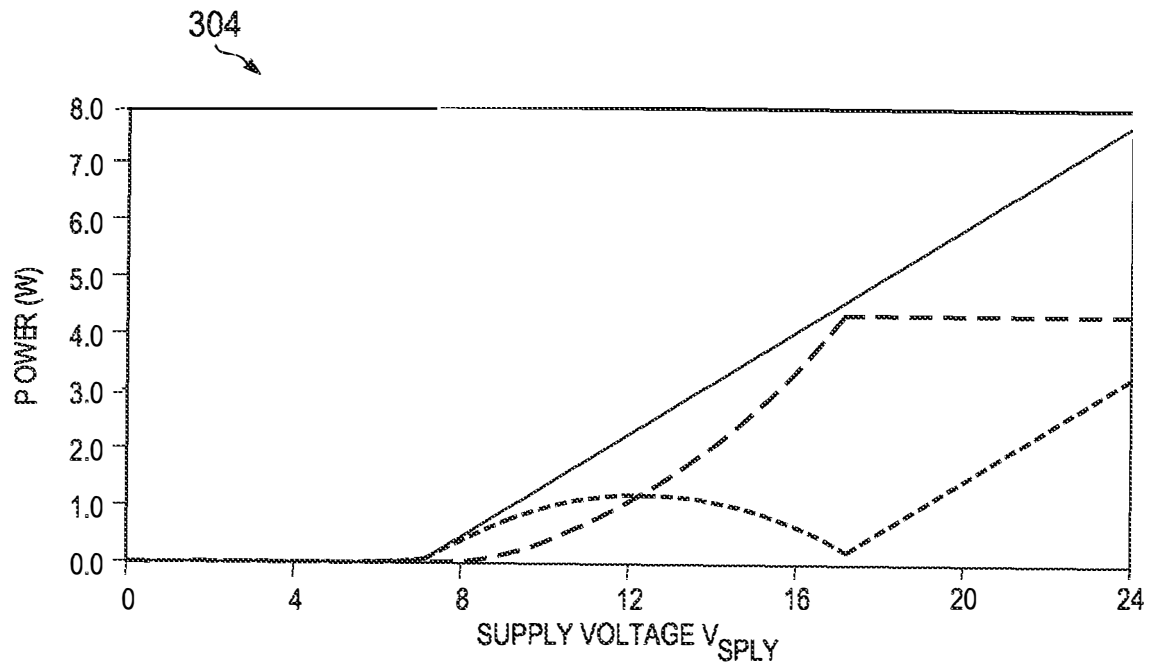
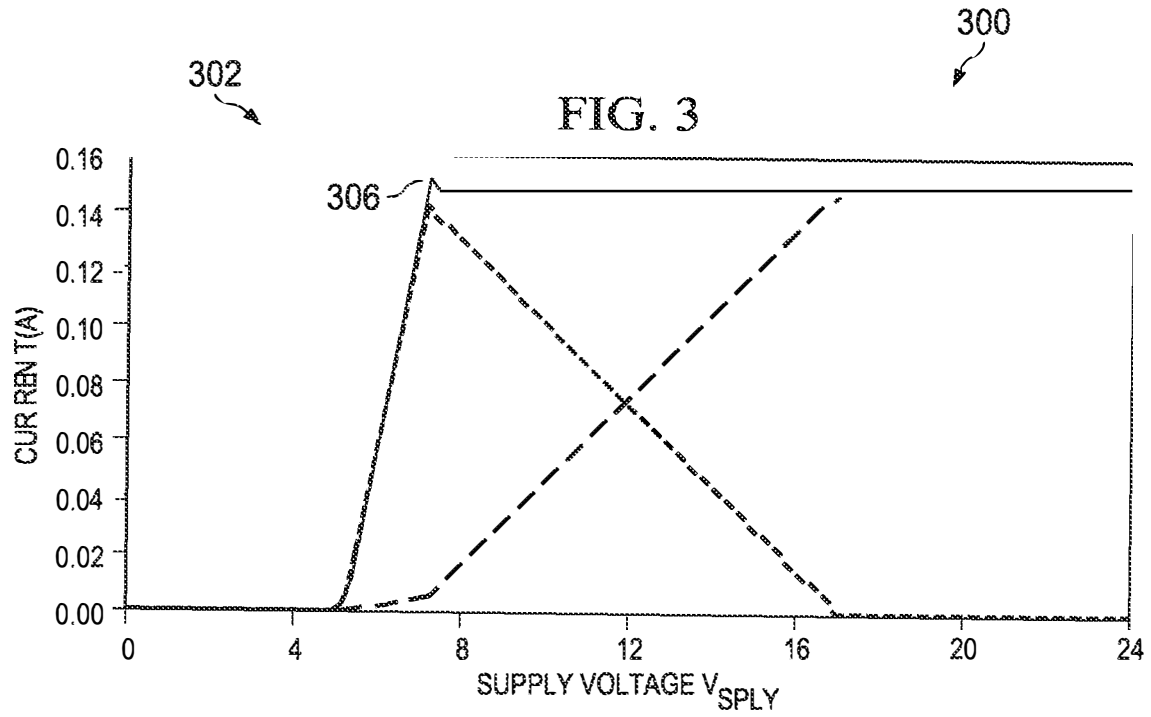
The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

1/3



2/3



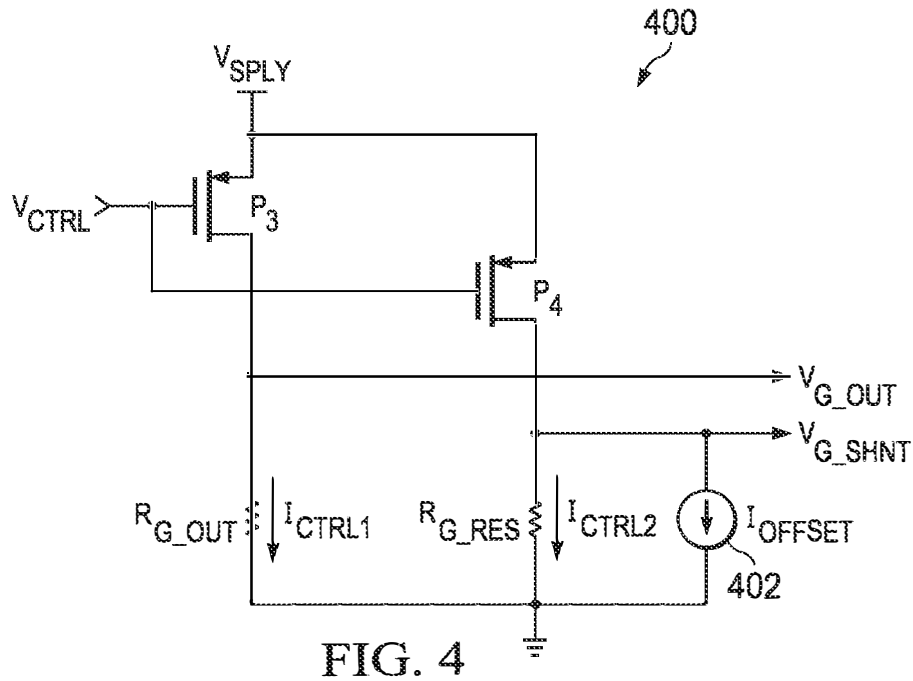


FIG. 4

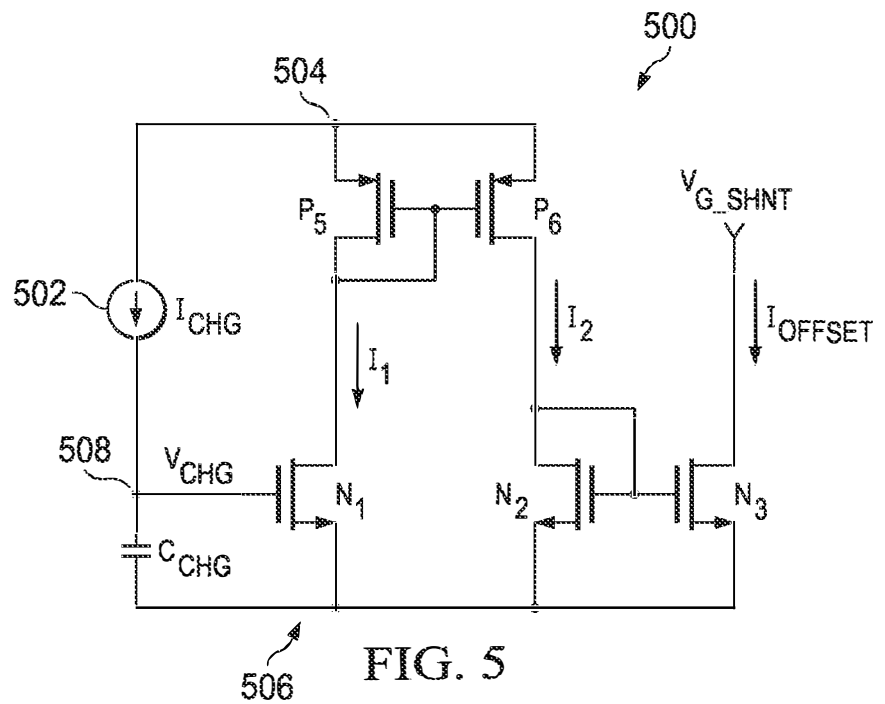


FIG. 5

Electronic Acknowledgement Receipt

EFS ID:	44451597
Application Number:	17537694
International Application Number:	
Confirmation Number:	7351
Title of Invention:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL
First Named Inventor/Applicant Name:	Xianghao Meng
Customer Number:	23494
Filer:	Christopher Harris
Filer Authorized By:	
Attorney Docket Number:	T100303US01
Receipt Date:	07-DEC-2021
Filing Date:	
Time Stamp:	12:38:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter accompanying New/ Add'l Drawings	T100303US01-Transmittal.pdf	291614	no	2
			748dcf396cdba1b0948ab00081476fc7b96 7328b		

Warnings:

Information:					
2	Drawings-only black and white line drawings	T100303US01- ReplacementDrawings.pdf	156803	no	3
			3839a84a29e44eb967a50488b5426414dcf300da		
Warnings:					
Information:					
Total Files Size (in bytes):			448417		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	herewith
First Named Inventor	Xianghao Meng
Title	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL
Art Unit	
Examiner Name	
Attorney Docket Number	T100303US01

SIGNATURE of Applicant or Patent Practitioner

Signature	/Christopher P Harris/	Date	2021-11-30
Name	Christopher P. Harris	Telephone	216.621.2234 ext. 104
Registration Number	43,660		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.



*Total of ¹ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number

Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)



I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

23494

OR



I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:



The address associated with the above-mentioned Customer Number

OR



The address associated with Customer Number:

OR



Firm or
Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Texas Instruments Incorporated



Inventor or Joint Inventor (title not required below)



Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)



Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)



Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

Jul 14, 2019

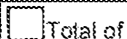
Name

Frank D. Cimino

Title

Vice President & Assistant General Counsel, Texas Instruments Incorporated

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.



Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:

Filing Date:

Title of Invention:

LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

First Named Inventor/Applicant Name:

Xianghao Meng

Filer:

Christopher Harris

Attorney Docket Number:

T100303US01

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800

Pages:

Claims:

Miscellaneous-Filing:

LATE FILING FEE FOR OATH OR DECLARATION	1051	1	160	160
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Petition:

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1980

Electronic Acknowledgement Receipt

EFS ID:	44390986
Application Number:	17537694
International Application Number:	
Confirmation Number:	7351
Title of Invention:	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL
First Named Inventor/Applicant Name:	Xianghao Meng
Customer Number:	23494
Filer:	Christopher Harris
Filer Authorized By:	
Attorney Docket Number:	T100303US01
Receipt Date:	30-NOV-2021
Filing Date:	
Time Stamp:	11:32:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$1980
RAM confirmation Number	E2021ATB33373713
Deposit Account	200668
Authorized User	Christopher Harris

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	T100303US01-TransNEW.pdf	135736	no	1
			ce1dfa7a3d127577b4e4b0179794aab11dfb94		

Warnings:**Information:**

2	Fee Worksheet (SB06)	T100303US01-TransFEE.pdf	112940	no	1
			36994bbae863ae405c87bc7d475388c4f249932f		

Warnings:**Information:**

3		T100303US01-SpecClaimsAbstract.pdf	80675	yes	16
			e4abbefcf592f59b86a996888f2ed7ca27cc3df		

Multipart Description/PDF files in .zip description

	Document Description	Start	End
	Specification	1	10
	Claims	11	15
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Warnings:**Information:**

4	Drawings-only black and white line drawings	T100303US01-Drawings.pdf	275354	no	3
			1fb369394e68c02511535fcc05e51d7d5dc3bc7d		

Warnings:**Information:**

5	Application Data Sheet	T100303US01-ADS.pdf	1823318	no	8
			e46c9afab77a30722fb1ef4c0509d7e71fbc817d		

Warnings:					
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6	Power of Attorney	T100303US01-TransPOA.pdf	522696	no	2
			9ccd557414dbbbb44a26925861f49aa13d3ca87d		
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	46389	no	2
			96fb2f575a8f7e6cbf895e84934286fda7954118		
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LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL

TECHNICAL FIELD

[0001] This description relates generally to electronic circuits, and more particularly to an LED driver system with slew-rate control.

BACKGROUND

[0002] Light-emitting diodes (LEDs) are implemented for a variety of illumination applications. For some illumination applications, LEDs are arranged in series as an LED string to provide sufficient illumination intensity, such as on vehicle indicator lights (e.g., turn signals, brake-lights, reverse-indicators, etc. for an automobile). Driver circuits can regulate current that is delivered through the LED strings to activate the LED strings for illumination. As an example, the driver circuit can regulate the current amplitude based on an amplitude of a supply voltage, such as from a battery or other dynamic voltage source.

SUMMARY

[0003] One example described herein includes a light-emitting diode (LED) driver system. The system includes an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage. The system further includes an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage. The amplifier output stage comprises a slew-rate controller configured to control a slew-rate of the shunt current. The shunt current can be provided through a shunt resistor in the second current path and being added to the output current to provide a total current through an LED string.

[0004] Another example described herein includes an LED system. The system includes an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage. The system also includes an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage. The amplifier output stage comprises a slew-rate controller configured to control a slew-rate of the shunt current. The system further includes a shunt resistor in the second current path and being configured to conduct the shunt current. The system further includes an LED string arranged at an output of the first current path and the

second current path and being configured to illuminate in response to a total current comprising a sum of the output current and the shunt current.

[0005] Another example described herein includes an LED driver system. The system includes a first power transistor comprising an input and an output coupled to receive an LED string and a second power transistor comprising an input and an output coupled to receive an LED string and a shunt resistor. The system also includes an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage. The system further includes an amplifier output stage comprising an input coupled to the output of the error amplifier, a first output coupled to the input of the first power transistor, and a second output coupled to the input of the second power transistor. The amplifier output stage includes a slew-rate controller, the slew-rate controller comprising an output coupled to the input of the second power transistor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is an example block diagram of an LED driver system.

[0007] FIG. 2 is an example of an LED driver circuit.

[0008] FIG. 3 is an example diagram of graphs.

[0009] FIG. 4 is an example of an amplifier output stage circuit.

[0010] FIG. 5 is an example of a slew-rate controller circuit.

DETAILED DESCRIPTION

[0011] This description relates generally to electronic circuits, and more particularly to an LED driver system with slew-rate control. The LED driver system can be implemented in any of a variety of LED control systems to provide illumination, such as a vehicle. For example, multiple LED driver systems described herein can be implemented in an automobile for controlling indicator lights. The LED driver system includes an error amplifier that is configured compare an input voltage with a reference voltage, and to provide a control voltage in response to the comparison. As an example, the input voltage can be provided based on a supply voltage, such as provided from a battery. The LED driver system also includes an LED string that is coupled to a first current path and includes a shunt resistor that is arranged in a second current path and which is coupled to the first current path.

[0012] The LED driver system further includes an amplifier output stage that is configured to generate a transistor input voltage based on the control voltage. The transistor input voltage can be provided to control a power transistor that can conduct a portion of a total output current through the shunt resistor. As an example, the second current path can conduct a shunt current and the first current path can conduct an output current that is added to the shunt current to be provided through the LED string as a total current. The amplifier output stage can control the respective amplitudes of the output current and the shunt current based on the resistance of the shunt resistor and the control voltage provided by the error amplifier. As an example, the output current and the shunt current can have an approximately constant amplitude sum, expressed as a total output current, such that a greater proportion of a total output current is provided through the shunt resistor as the input voltage increases relative to the reference current.

[0013] As an example, the transistor input voltage includes a first transistor input voltage and a second transistor input voltage that are provided to a first power transistor that conducts the output current and a second power transistor that conducts the shunt current, respectively. The first and second transistor input voltages can be generated by the amplifier output stage based on the control voltage being provided to first and second control transistors that can conduct respective first and second control currents. However, the second power transistor can also be controlled by a slew-rate controller that is configured to control a slew-rate of the shunt current through the shunt resistor. As an example, the slew-rate controller can conduct an offset current in parallel with the second control current to generate the second transistor input voltage. The offset current can be controlled based on a charging capacitor, such that the slew-rate of the offset current can likewise control the slew-rate of the shunt current. Accordingly, by controlling the slew-rate of the shunt current through the shunt resistor, transient effects and electromagnetic interference (EMI) can be mitigated in the LED driver system.

[0014] FIG. 1 is an example block diagram of an LED driver system 100. The LED driver system 100 can be implemented in any of a variety of LED control systems to provide illumination, such as a vehicle. For example, multiple LED driver systems 100, as described herein, can be implemented in an automobile for controlling indicator lights.

[0015] The LED driver system 100 includes an error amplifier 102, an amplifier output stage 104, an LED string 106, and a shunt resistor 108. As an example, the error amplifier 102 and the amplifier output stage 104 can be fabricated in or as part of an integrated circuit (IC)

chip. The error amplifier 102 is configured to compare an input voltage with a reference voltage, and to provide a control voltage in response to the comparison. In the example of FIG. 1, the LED driver system 100 is demonstrated as receiving a supply voltage V_{SPLY} , which can be a voltage provided from a battery. Thus, the input voltage can be based on the supply voltage V_{SPLY} . The reference voltage can be an approximately constant voltage, such as generated from a constant current source.

[0016] The amplifier output stage 104 can be configured to control an amplitude of an output current I_{OUT} in a first current path and the amplitude of a shunt current I_{SHNT} in a second current path that includes the shunt resistor 108. The amplifier output stage 104 can control the respective amplitudes of the output current I_{OUT} and the shunt current I_{SHNT} based on the control voltage provided by the error amplifier. As an example, the output current I_{OUT} and the shunt current I_{SHNT} can have an approximately constant amplitude sum, expressed as a total output current I_{TOT} that is provided through the LED string 106, such that a greater proportion of a total output current I_{TOT} is provided through the shunt resistor as the input voltage increases relative to the reference voltage. Because the shunt resistor 108 can be arranged external to the IC chip that can accommodate the error amplifier 102 and the amplifier output stage 104, the LED driver system 100 can therefore provide thermal protection for the IC chip by diverting excess current resulting from higher amplitudes of the supply voltage V_{SPLY} through the shunt resistor 108.

[0017] In the example of FIG. 1, the LED driver system 100 includes power transistors 110. As an example, amplifier output stage 104 can generate a first transistor input voltage and a second transistor input voltage that are provided to a first power transistor of the power transistors 110 that conducts the output current I_{OUT} and a second power transistor of the power transistors 110 that conducts the shunt current I_{SHNT} , respectively. The first and second transistor input voltages can be generated by the amplifier output stage 104 based on the control voltage being provided to first and second control transistors that can conduct respective first and second control currents. As an example, the first and second control currents generate the transistor input voltages of the respective first and second power transistors. In the example of FIG. 1, the amplifier output stage 104 also includes a slew-rate controller 112. The slew-rate controller 112 is configured to control the slew-rate of the shunt current I_{SHNT} through the shunt resistor 108.

[0018] As an example, the slew-rate controller 112 can generate an offset current in parallel with the second control current to generate the second transistor input voltage. As an example,

the slew-rate controller 112 can include a charging capacitor and at least one current mirror. The charging capacitor can be charged by a charging current to generate a charging voltage, such that the charging voltage can control an amplitude of a current at a slew-rate based on the capacitance of the charging capacitor. The offset current can be controlled based on a charging capacitor, such that the slew-rate of the offset current can likewise control the slew-rate of the shunt current I_{SHNT} . Accordingly, by controlling the slew-rate of the shunt current I_{SHNT} through the shunt resistor, transient effects and electromagnetic interference (EMI) can be mitigated in the LED driver system 100.

[0019] FIG. 2 is an example of an LED driver circuit 200. The LED driver circuit 200 can be the LED driver system 100 in the example of FIG. 1. Therefore, reference is to be made to the example of FIG. 1 in the following description of the example of FIG. 2.

[0020] The LED driver circuit 200 includes an error amplifier 202 and an amplifier output stage 204. In the example of FIG. 2, the error amplifier 202 and the amplifier output stage 204 can be fabricated in or as part of an integrated circuit (IC) chip, demonstrated at 206. In the example of FIG. 2, the error amplifier 202 is configured to compare an input voltage V_{IN} with a reference voltage V_{REF} , and to provide a control voltage V_{CTRL} in response to the comparison. In the example of FIG. 2, the LED driver circuit 200 is demonstrated as receiving a supply voltage V_{SPLY} , which can be a voltage provided from a battery. Thus, the input voltage V_{IN} is generated based on the supply voltage V_{SPLY} via an input resistor R_{IN} . The reference voltage V_{REF} is generated based on a current source 208 that conducts a reference current I_{REF} through a reference resistor R_{REF} that is coupled to the supply voltage V_{SPLY} . Therefore, the reference voltage V_{REF} can be an approximately constant voltage.

[0021] The amplifier output stage 204 is demonstrated in the example of FIG. 2 as providing a first input voltage V_{G_OUT} to an input (e.g., gate) of a first power transistor P_1 and a second input voltage V_{G_SHNT} to an input (e.g., gate) of a second power transistor P_2 . The power transistors P_1 and P_2 are arranged as P-channel metal-oxide field-effect transistors (P-FETs) having a source coupled to the input voltage V_{IN} . The first power transistor P_1 is arranged in a first current path in which the output current I_{OUT} flows from the input voltage V_{IN} , with the first current path being coupled to an LED string 210. The second power transistor P_2 is arranged in a second current path in which the shunt current I_{SHNT} flows from the input voltage V_{IN} , with the second current path including a shunt resistor R_{SHNT} . The amplifier output stage 204 therefore controls

an amplitude of the output current I_{OUT} in the first current path that includes the LED string 210 and the shunt current I_{SHNT} in the second current path that includes the shunt resistor R_{SHNT} based on the control voltage V_{CTRL} .

[0022] In the example of FIG. 2, the output current I_{OUT} and the shunt current I_{SHNT} are combined to form a total output current I_{TOT} that is provided through the LED string 210. As an example, the total output current I_{TOT} can have an approximately constant amplitude sum of the output current I_{OUT} and the shunt current I_{SHNT} , such that a greater proportion of a total output current I_{TOT} is provided through the shunt resistor R_{SHNT} as the input voltage V_{IN} increases relative to the reference current V_{REF} . Because the shunt resistor R_{SHNT} can be arranged external to the IC chip that can accommodate the error amplifier 202 and the amplifier output stage 204, the LED driver circuit 200 can therefore provide thermal protection for the associated IC chip by diverting excess current resulting from higher amplitudes of the supply voltage V_{SPLY} through the shunt resistor R_{SHNT} .

[0023] FIG. 3 is an example diagram 300 of graphs. The diagram 300 includes a first graph 302 that plots current as a function of the supply voltage V_{SPLY} and a second graph 304 that plots power as a function of the supply voltage V_{SPLY} . The current and power in the first and second graphs, respectively, can result from the operation of the LED driver circuit 200. Therefore, reference is to be made to the example of FIG. 2 in the following description of the example of FIG. 3.

[0024] The first graph 302 demonstrates three plots that are the total output current I_{TOT} through the LED string 210, the output current I_{OUT} , and the shunt current I_{SHNT} through the shunt resistor R_{SHNT} . In the example of FIG. 3, the total output current I_{TOT} is demonstrated by a solid line, the output current I_{OUT} is demonstrated by a dashed line, and the shunt current I_{SHNT} is demonstrated by a dotted line. The first graph 302 demonstrates that the sum of the amplitude of the output current I_{OUT} and the shunt current I_{SHNT} is approximately equal to the amplitude of the total output current I_{TOT} . In the example of FIG. 3, the output current I_{OUT} is approximately equal to the total output current I_{TOT} to a supply voltage V_{SPLY} of approximately 7 volts, at which time the power transistor P_2 is activated (e.g., with a gate-source voltage V_{GS} that is greater than a threshold voltage) to begin conducting the shunt current I_{SHNT} . Therefore, as the supply voltage V_{SPLY} increases, the output current I_{OUT} decreases linearly, while the shunt current I_{SHNT} increases linearly in an inverse manner.

[0025] The second graph 304 demonstrates three plots that are the total output power, as provided by the total output current I_{TOT} through the LED string 210, the output current I_{OUT} , and the shunt current I_{SHNT} through the shunt resistor R_{SHNT} , respectively. In the example of FIG. 3, the power consumption of the total output current I_{TOT} is demonstrated by a solid line, the power consumption of the output current I_{OUT} is demonstrated by a dashed line, and the power consumption of the shunt current I_{SHNT} is demonstrated by a dotted line. Similar to the first graph 302, the second graph 304 demonstrates that the sum of the power of the output current I_{OUT} and the shunt current I_{SHNT} is approximately equal to the power of the total output current I_{TOT} . In the example of FIG. 3, the power dissipated in the IC 206 remains constant at amplitudes of the supply voltage V_{SPLY} that are greater than or equal to approximately 17 volts. Additional power consumption greater than approximately 17 volts is provided through the shunt resistor R_{SHNT} .

[0026] As a result of the operation of the amplifier output stage 204, the LED driver circuit 200 can mitigate thermal dissipation within the IC 206 resulting from excessive current flow that is based on higher amplitudes of the supply voltage V_{SPLY} . As demonstrated in the example of FIG. 3, the LED driver circuit 200 can mitigate thermal dissipation in the IC 206 by diverting larger portions of the total output current I_{TOT} as the shunt current I_{SHNT} through the shunt resistor R_{SHNT} , and thereby dissipating heat in the shunt resistor R_{SHNT} , as the supply voltage V_{SPLY} increases.

[0027] Referring back to the example of FIG. 2, the amplifier output stage 204 includes a slew-rate controller 212. The slew-rate controller 212 is configured to control the slew-rate of the shunt current I_{SHNT} through the shunt resistor R_{SHNT} . As an example, the slew-rate controller 212 can generate an offset current in parallel with the second control current to generate the second transistor input voltage V_{G_SHNT} . The offset current can have a predefined slew-rate that can result in a more gradual decrease of the second transistor input voltage V_{G_SHNT} , which can result in a more gradual increase of the amplitude of the shunt current I_{SHNT} .

[0028] As described herein, by controlling the slew-rate of the shunt current I_{SHNT} through the shunt resistor R_{SHNT} , transient effects and EMI can be mitigated in the LED driver circuit 200. Particularly, with reference to the example of FIG. 3, the total current I_{TOT} includes a small amplitude spike, demonstrated at 306, that is a transient increase resulting from the second power transistor P_2 changing from the cutoff mode to the linear mode. The slew-rate control of the

second transistor input voltage V_{G_SHNT} can mitigate the transient current amplitude spike, thereby settling the amplitude of the total current I_{TOT} . Furthermore, controlling the slew-rate of the second transistor input voltage V_{G_SHNT} , and thus the amplitude of the shunt current I_{SHNT} , can reduce undesired EMI that can introduce noise in the LED driver circuit 200 and/or other proximal circuits.

[0029] FIG. 4 is an example of an amplifier output stage circuit 400. The amplifier output stage circuit 400 can be the amplifier output stage 204 in the example of FIG. 2. Therefore, reference is to be made to the examples of FIGS. 2 and 3 in the following example of FIG. 4.

[0030] The amplifier output stage circuit 400 includes a first control transistor P_3 and a second control transistor P_4 that are each provided the control voltage V_{CTRL} to respective inputs (e.g., gates). In the example of FIG. 4, the control transistors P_3 and P_4 are arranged as P-FETs having a source coupled to the supply voltage V_{SPLY} . In response to the control voltage V_{CTRL} , the first control transistor P_3 is configured to conduct a first control current I_{CTRL1} from the supply voltage V_{SPLY} through a resistor R_{G_OUT} to generate the first transistor input voltage V_{G_OUT} . Similarly, in response to the control voltage V_{CTRL} , the second control transistor P_4 is configured to conduct a second control current I_{CTRL2} from the supply voltage V_{SPLY} through a resistor R_{G_RES} to generate the second transistor input voltage V_{G_SHNT} . As described above, the first and second transistor input voltages V_{G_OUT} and V_{G_SHNT} are provided to the inputs of the respective first and second power transistors P_1 and P_2 to control the output current I_{OUT} and the shunt current I_{SHNT} , respectively.

[0031] In the example of FIG. 4, the amplifier output stage circuit 400 includes a slew-rate controller 402 that is demonstrated as a current source configured to conduct an offset current I_{OFFSET} in parallel with the second control current I_{CTRL2} . The offset current I_{OFFSET} can have a predefined slew-rate, such that the offset current I_{OFFSET} can decrease the second transistor input voltage V_{G_SHNT} at the slew-rate. As a result, the second power transistor P_2 can more gradually increase the amplitude of the shunt current I_{SHNT} after transitioning from the cutoff mode to the linear mode. Accordingly, transient effects of the total output current I_{TOT} and undesired EMI can be mitigated in the LED driver circuit 200, as described herein.

[0032] FIG. 5 is an example of a slew-rate controller circuit 500. The slew-rate controller circuit 500 can be the slew-rate controller 402 in the example of FIG. 4. Therefore, reference is to be made to the example of FIG. 4 in the following description of the example of FIG. 5.

[0033] The slew-rate controller circuit 500 includes a charging current source 502 that is configured to conduct a charging current I_{CHG} from a high-voltage rail, demonstrated at 504. As an example, the charging current I_{CHG} (e.g., less than $20\ \mu A$, such as $10\ \mu A$) can be provided in response to the second control current I_{CTRL2} , such as based on the second control current I_{CTRL2} . The slew-rate controller circuit 500 also includes a charging capacitor C_{CHG} that is arranged between the charging current source 502 and a low-voltage rail 506 (e.g., ground). The charging capacitor C_{CHG} can have a capacitance value that defines the slew-rate of the offset current I_{OFFSET} , and thus the slew-rate of the second transistor input voltage V_{SHNT} and the slew-rate of the shunt current I_{SHNT} .

[0034] In response to activation of the charging current source 502, the charging current I_{CHG} begins to charge the charging capacitor C_{CHG} , which causes a charging voltage V_{CHG} to increase at a rate that is based on the capacitance of the charging capacitor C_{CHG} . The charging voltage V_{CHG} can be provided on a charging terminal 508 that is coupled to an input (e.g., gate) of a transistor N_1 , demonstrated as an N-channel FET (N-FET). Therefore, the charging voltage V_{CHG} can control the N-FET N_1 to conduct a current I_1 through the N-FET N_1 and through a P-FET P_5 . The P-FET P_5 is demonstrated in the example of FIG. 5 as diode-connected, such that the drain and gate of the P-FET P_5 are coupled, and are likewise coupled to a gate of a P-FET P_6 . Therefore, the P-FET P_6 operates as a current-mirror with respect to the N-FET N_1 and the P-FET P_5 to conduct a current I_2 . The current I_2 likewise flows through a diode-connected N-FET N_2 . The gate and drain of the N-FET N_2 is likewise coupled to a gate of an N-FET N_3 , such that the N-FET operates as a current-mirror with respect to the N-FET N_2 and the P-FET P_6 to conduct the offset current I_{OFFSET} .

[0035] Therefore, as the charging voltage V_{CHG} gradually increases based on the capacitance of the charging capacitor C_{CHG} , the currents I_1 , I_2 , and I_{OFFSET} gradually increase at the slew-rate defined by the capacitance of the charging capacitor C_{CHG} . The offset current I_{OFFSET} therefore decreases the amplitude of the second transistor input voltage V_{G_SHNT} across the resistor R_{G_RES} . As a result, the channel of the second power transistor P_2 gradually increases to likewise gradually increase the shunt current I_{SHNT} at the slew-rate defined by the capacitance of the charging capacitor C_{CHG} . Accordingly, the slew-rate control of the shunt current I_{SHNT} through the shunt resistor R_{SHNT} can mitigate EMI and transient effects in the LED driver circuit 200.

[0036] In this description, the term "couple" may cover connections, communications, or signal paths that enable a functional relationship consistent with this description. For example, if device A generates a signal to control device B to perform an action, then: (a) in a first example, device A is directly coupled to device B; or (b) in a second example, device A is indirectly coupled to device B through intervening component C if intervening component C does not substantially alter the functional relationship between device A and device B, so device B is controlled by device A via the control signal generated by device A.

[0037] Also, in this description, a device that is "configured to" perform a task or function may be configured (e.g., programmed and/or hardwired) at a time of manufacturing by a manufacturer to perform the function and/or may be configurable (or reconfigurable) by a user after manufacturing to perform the function and/or other additional or alternative functions. The configuring may be through firmware and/or software programming of the device, through a construction and/or layout of hardware components and interconnections of the device, or a combination thereof. Furthermore, a circuit or device described herein as including certain components may instead be configured to couple to those components to form the described circuitry or device. For example, a structure described as including one or more semiconductor elements (such as transistors), one or more passive elements (such as resistors, capacitors, and/or inductors), and/or one or more sources (such as voltage and/or current sources) may instead include only the semiconductor elements within a single physical device (e.g., a semiconductor wafer and/or integrated circuit (IC) package) and may be configured to couple to at least some of the passive elements and/or the sources to form the described structure, either at a time of manufacture or after a time of manufacture, such as by an end user and/or a third party.

[0038] Modifications are possible in the described embodiments, and other embodiments are possible, within the scope of the claims.

CLAIMS

What is claimed is:

1. A light-emitting diode (LED) driver system comprising:
an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and
an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage, the amplifier output stage comprising a slew-rate controller configured to control a slew-rate of the shunt current, the shunt current provided through a shunt resistor in the second current path and added to the output current to provide a total current through an LED string.
2. The system of claim 1, further comprising:
a first power transistor configured to conduct the output current in the first current path based on a first transistor input voltage; and
a second power transistor configured to conduct the shunt current in the second current path based on a second transistor input voltage.
3. The system of claim 2, wherein the amplifier output stage comprises:
a first control transistor configured to conduct a first control current based on the control voltage to generate the first transistor input voltage; and
a second control transistor configured to conduct a second control current based on the control voltage to generate the second transistor input voltage.
4. The system of claim 3, wherein the slew-rate controller is configured to conduct an offset current in parallel with the second control current to generate the second transistor input voltage, the offset current increasing at the slew-rate.

5. The system of claim 4, wherein the slew-rate controller comprises:
 - a charging current generator configured to generate a charging current;
 - a charging capacitor that is charged by a charging current to generate a charging voltage;
 - a current mirror configured to conduct the offset current based on the charging voltage.
6. The system of claim 1, wherein the amplifier output stage is configured to increase an amplitude of the shunt current and decrease an amplitude of the output current as the supply voltage increases.
7. The system of claim 1, wherein the slew-rate controller comprises a charging capacitor having a capacitance that defines the slew-rate of the shunt current.
8. The system of claim 7, further comprising a power transistor configured to conduct the shunt current in the second current path based on a transistor input voltage, wherein the charging capacitor is configured to generate a charging voltage to control an amplitude of an offset current via a current mirror, wherein the offset current is configured to control the transistor input voltage.
9. The system of claim 8, wherein the amplifier output stage comprises a control transistor that is controlled by the control voltage, wherein the control transistor is coupled to an input of the power transistor to set an initial amplitude of the transistor input voltage, wherein the offset current is subtracted from the initial amplitude to control the power transistor based on the slew-rate.
10. An integrated circuit (IC) chip comprising the LED driver system of claim 1.
11. A light-emitting diode (LED) system comprising:
 - an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and
 - an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage, the amplifier

output stage comprising a slew-rate controller configured to control a slew-rate of the shunt current;

a shunt resistor in the second current path to conduct the shunt current; and

an LED string arranged at an output of the first current path and the second current path to illuminate in response to a total current comprising a sum of the output current and the shunt current.

12. The system of claim 11, wherein the slew-rate controller comprises a charging capacitor having a capacitance that defines the slew-rate of the shunt current.

13. The system of claim 12, further comprising a power transistor configured to conduct the shunt current in the second current path based on a transistor input voltage, wherein the charging capacitor is configured to generate a charging voltage to control an amplitude of an offset current via a current mirror, wherein the offset current is configured to control the transistor input voltage.

14. The system of claim 13, wherein the amplifier output stage comprises a control transistor that is controlled by the control voltage, wherein the control transistor is coupled to an input of the power transistor to set an initial amplitude of the transistor input voltage, wherein the offset current is subtracted from the initial amplitude to control the power transistor based on the slew-rate.

15. The system of claim 11, further comprising:

a first power transistor configured to conduct the output current in the first current path based on a first transistor input voltage; and

a second power transistor configured to conduct the shunt current in the second current path based on a second transistor input voltage;

wherein the amplifier output stage comprises:

a first control transistor configured to conduct a first control current based on the control voltage to generate the first transistor input voltage; and

a second control transistor configured to conduct a second control current based on the control voltage to generate the second transistor input voltage, wherein the slew-rate controller is configured to conduct an offset current in parallel with the second control current to generate the second transistor input voltage, the offset current increasing at the slew-rate.

16. A light-emitting diode (LED) driver system comprising:

a first power transistor comprising an input and an output coupled to receive an LED string and a shunt resistor;

a second power transistor comprising an input and an output coupled to receive the shunt resistor;

an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage; and

an amplifier output stage comprising an input coupled to the output of the error amplifier, a first output coupled to the input of the first power transistor, and a second output coupled to the input of the second power transistor, the amplifier output stage comprising a slew-rate controller, the slew-rate controller comprising an output coupled to the input of the second power transistor.

17. The system of claim 16, wherein the amplifier output stage is configured to control an amplitude of an output current through a first current path that includes the LED string and a shunt current through a second current path that includes the shunt resistor based on the control voltage.

18. The system of claim 17, wherein the slew-rate controller comprises a charging capacitor having a capacitance that defines the slew-rate of the shunt current.

19. The system of claim 18, further comprising a power transistor configured to conduct the shunt current in the second current path based on a transistor input voltage, wherein the charging capacitor is configured to generate a charging voltage to control an amplitude of an offset current via a current mirror, wherein the offset current is configured to control the transistor input voltage.

20. The system of claim 19, wherein the amplifier output stage comprises a control transistor that is controlled by the control voltage, wherein the control transistor is coupled to an input of the power transistor to set an initial amplitude of the transistor input voltage, wherein the offset current is subtracted from the initial amplitude to control the power transistor based on the slew-rate.

ABSTRACT OF THE DISCLOSURE

One example described herein includes a light-emitting diode (LED) driver system. The system includes an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage. The system further includes an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage. The amplifier output stage comprises a slew-rate controller configured to control a slew-rate of the shunt current. The shunt current can be provided through a shunt resistor in the second current path and added to the output current to provide a total current through an LED string.

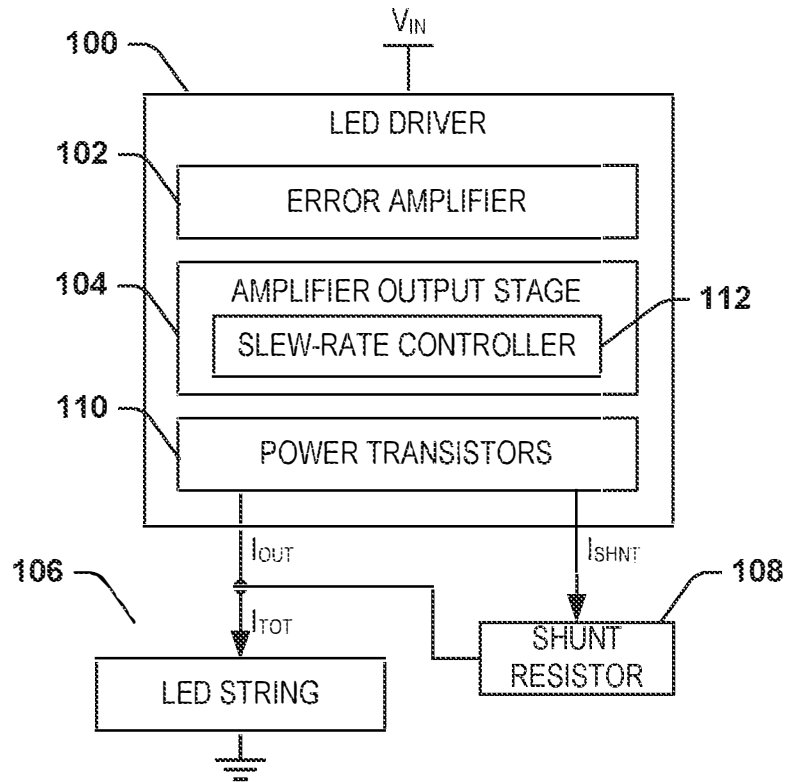


FIG. 1

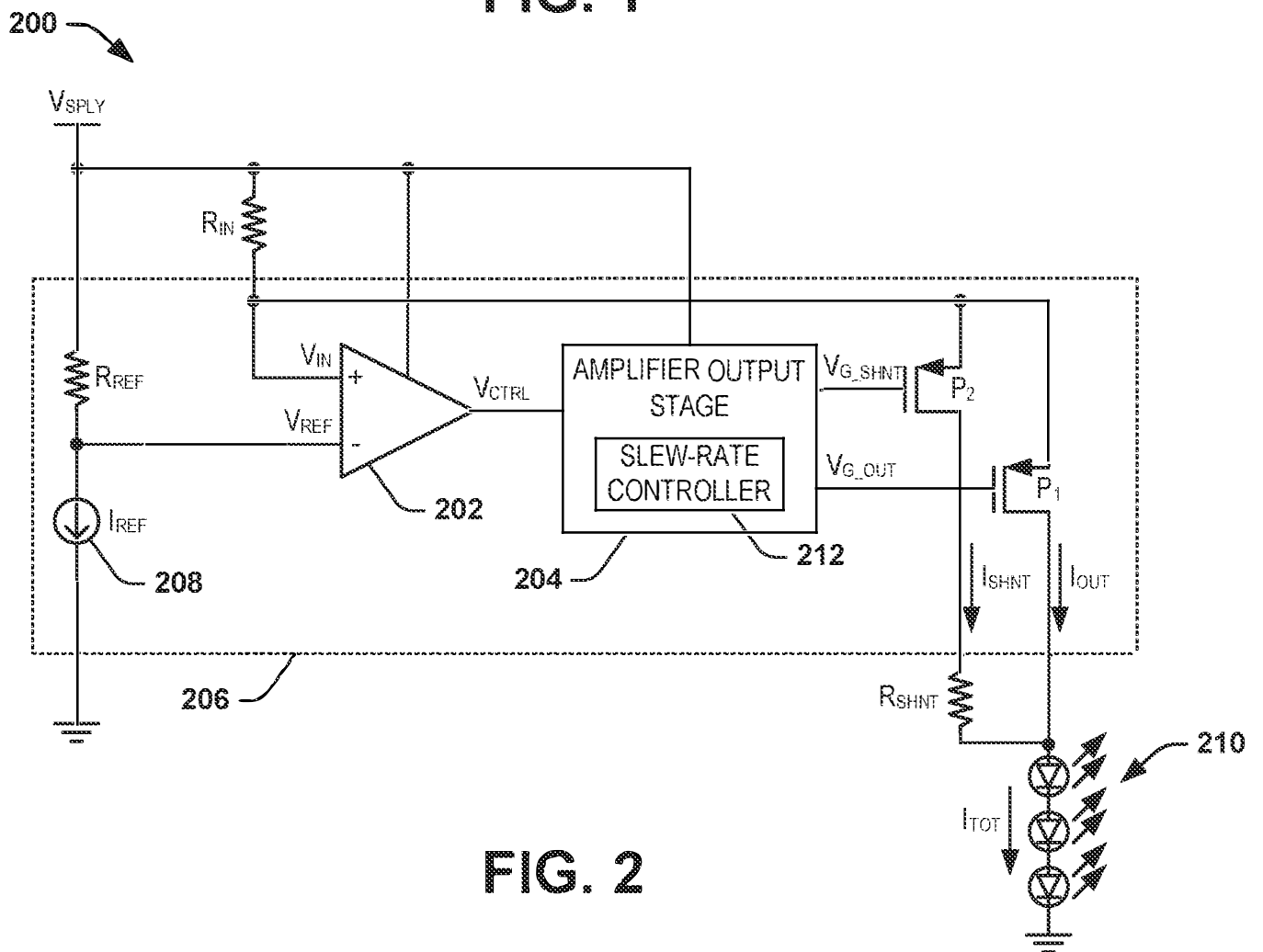


FIG. 2

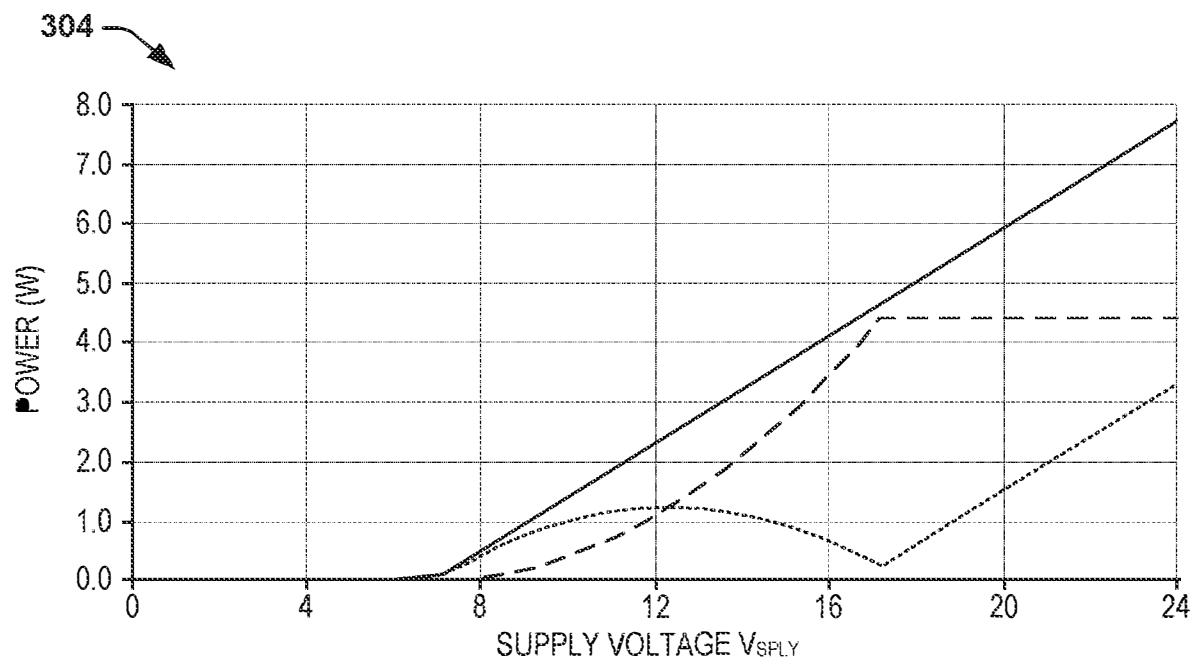
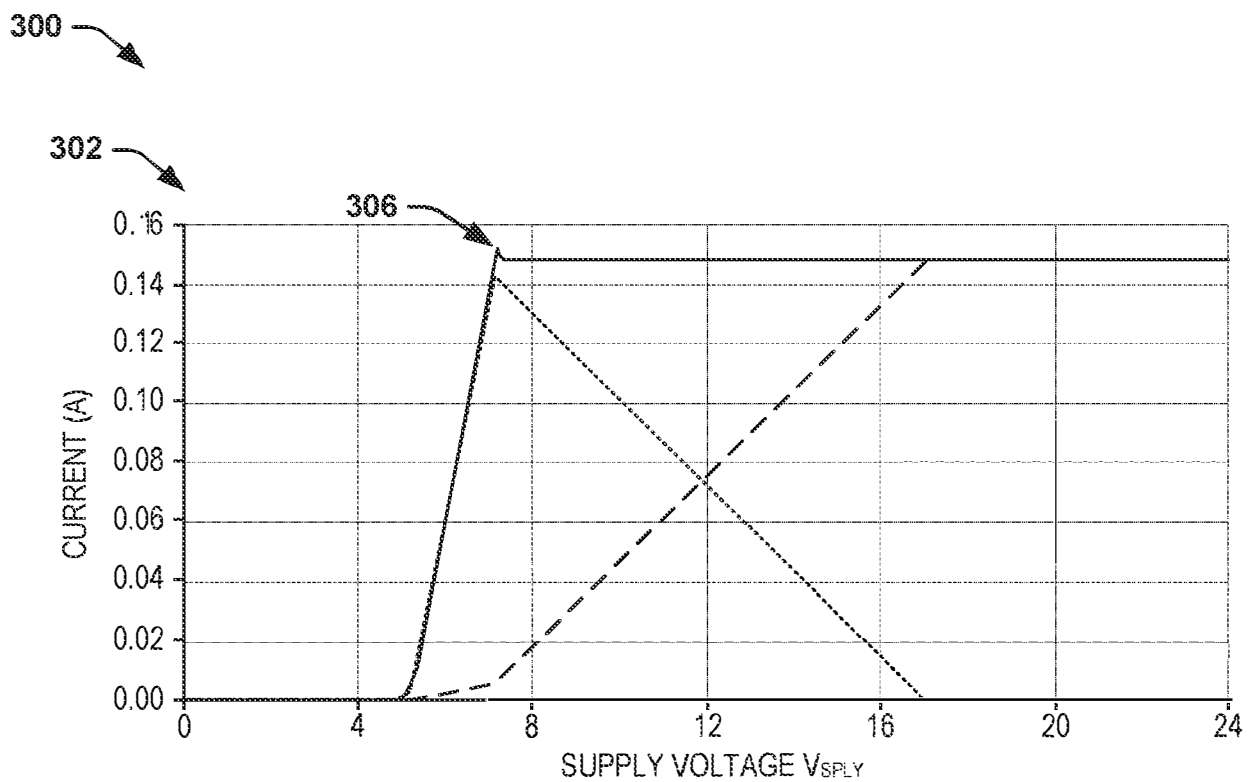


FIG. 3

400

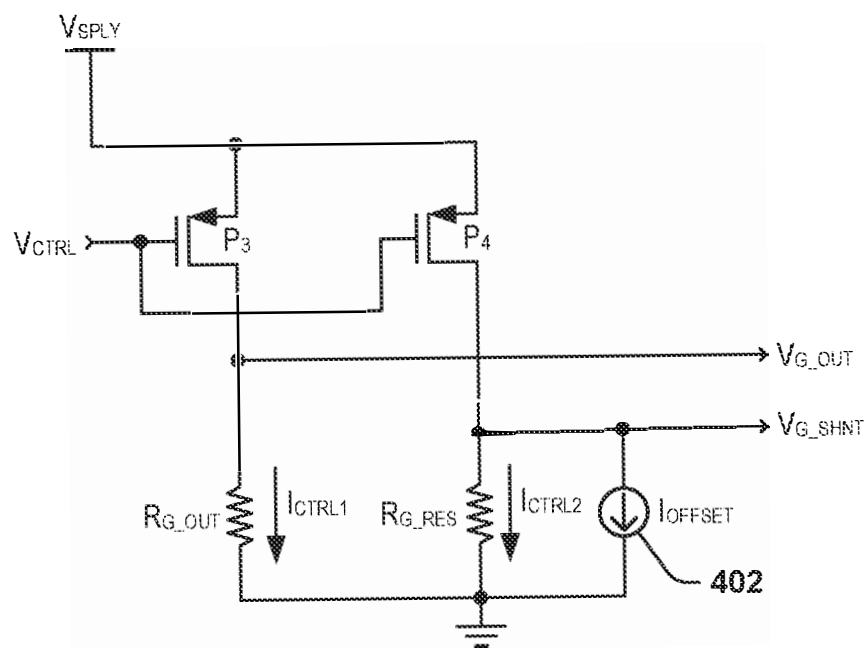


FIG. 4

500

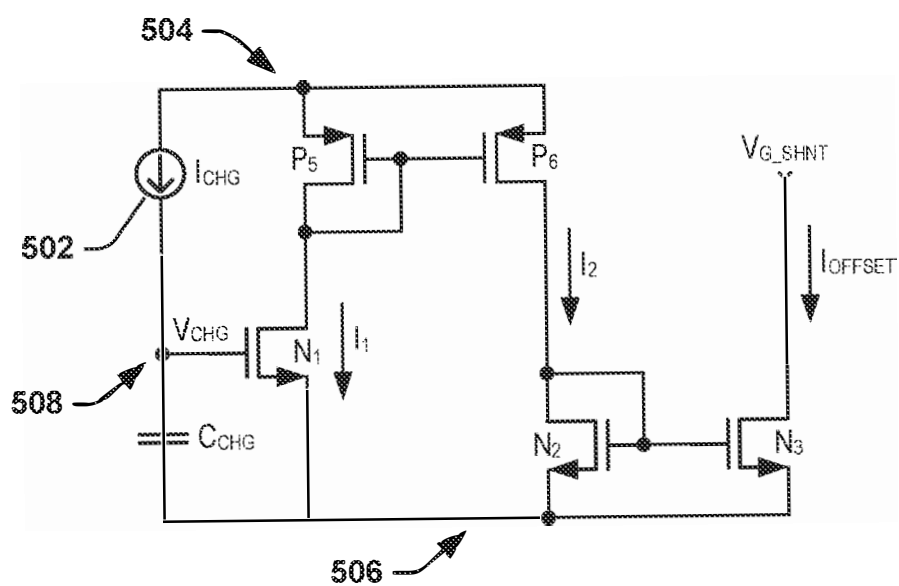


FIG. 5

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Xianghao		Meng		
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service					
City	SHANGHAI		Country of Residence ⁱ	CN	

Mailing Address of Inventor:

Address 1	Unit 302, No. 2, Lane 1650				
Address 2	Jinxu Road				
City	SHANGHAI	State/Province			
Postal Code	200127	Country ⁱ	CN		

Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Shangquan		iang		
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service					
City	SHANGHAI		Country of Residence ⁱ	CN	

Mailing Address of Inventor:

Address 1	Room 502, Building 8, No.1445, Yushan Road				
Address 2					
City	SHANGHAI	State/Province			
Postal Code	200135	Country ⁱ	CN		

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Correspondence Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence information of this application.

Customer Number	23494		
Email Address	uspto@ti.com	Add Email	Remove Email

Application Information:

Title of the Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEWRATE CONTROL		
Attorney Docket Number	T100303US01	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	3	Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	23494		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status		Remove
Application Number	Continuity Type	Prior Application Number
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.		

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant	1		Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor	
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	TEXAS INSTRUMENTS INCORPORATED		
Mailing Address Information For Applicant:			
Address 1	P.O. BOX 655474		
Address 2	M/S 3999		
City	DALLAS	State/Province	TX
Country	US	Postal Code	75265
Phone Number		Fax Number	214.567.2228
Email Address	uspto@ti.com		
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is **not** checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Christopher P Harris/		Date (YYYY-MM-DD)	2021-11-30
First Name	Christopher P.	Last Name	Harris	Registration Number
				43660
Additional Signature may be generated within this form by selecting the Add button. Add				

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	T100303US01
		Application Number	
Title of Invention	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW-RATE CONTROL		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Attorney Docket No.</td> <td>T100303US01</td> </tr> <tr> <td>First Named Inventor</td> <td>Xianghao Meng</td> </tr> <tr> <td>Title</td> <td>LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW RATE CONTROL</td> </tr> <tr> <td>Express Mail Label No.</td> <td>Via EFS</td> </tr> </table>	Attorney Docket No.	T100303US01	First Named Inventor	Xianghao Meng	Title	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW RATE CONTROL	Express Mail Label No.	Via EFS
Attorney Docket No.	T100303US01								
First Named Inventor	Xianghao Meng								
Title	LIGHT-EMITTING DIODE (LED) DRIVER SYSTEM WITH SLEW RATE CONTROL								
Express Mail Label No.	Via EFS								
APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450								
1. ☒ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☐ Applicant asserts small entity status. <i>See 37 CFR 1.27</i> 3. ☐ Applicant certifies micro entity status. <i>See 37 CFR 1.29.</i> <i>Applicant must attach form PTO/SB/15A or B or equivalent.</i> 4. ☒ Specification [Total Pages <u>16</u>] <i>Both the claims and abstract must start on a new page.</i> <i>(See MPEP § 603.01(a) for information on the preferred arrangement)</i> 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>3</u>] 6. Inventor's Oath or Declaration [Total Pages _____] <i>(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))</i> a. ☐ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * <i>See note below.</i> <i>See 37 CFR 1.76 (PTO/AIA/14 or equivalent)</i> 8. CD-ROM or CD-R <i>in duplicate, large table, or Computer Program (Appendix)</i> ☐ Landscape Table on CD 9. Nucleotide and/or Amino Acid Sequence Submission <i>(if applicable, items a. -- c. are required)</i> a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☐ 37 CFR 3.73(c) Statement ☒ Power of Attorney <i>(when there is an assignee)</i> 12. ☐ English Translation Document <i>(if applicable)</i> 13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 14. ☐ Preliminary Amendment 15. ☐ Return Receipt Postcard <i>(MPEP § 503) (Should be specifically itemized)</i> 16. ☐ Certified Copy of Priority Document(s) <i>(if foreign priority is claimed)</i> 17. ☐ Nonpublication Request <i>Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.</i> 18. ☐ Other: _____ _____ _____ _____								
*Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS). (2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).									
19. CORRESPONDENCE ADDRESS									
☒ The address associated with Customer Number: <u>23494</u> OR ☐ Correspondence address below									
Name									
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City	State Zip Code								
Country	Telephone Email								
Signature	/Christopher P Harris/ Date 2021-11-30								
Name (Print/Type)	Christopher P. Harris Registration No. (Attorney/Agent) 43,660								

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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FEE TRANSMITTAL		Complete if known	
		Application Number	
		Filing Date	herewith
☐ Applicant asserts small entity status. See 37 CFR 1.27.		First Named Inventor	Xianghao Meng
☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.		Examiner Name	
		Art Unit	
TOTAL AMOUNT OF PAYMENT	(\$)	Practitioner Docket No.	T100303US01
	1,980.00		

METHOD OF PAYMENT (check all that apply)
☐ Check ☒ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 20-0668 Deposit Account Name: Texas Instruments Incorporated

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) ☒ Credit any overpayment of fee(s) under 37 CFR 1.16 and 1.17

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FEE CALCULATION**1. BASIC FILING, SEARCH, AND EXAMINATION FEES** (U = undiscounted fee; S = small entity fee; M = micro entity fee)

Application Type	FILING FEES			SEARCH FEES			EXAMINATION FEES			Fees Paid (\$)
	U (\$)	S (\$)	M (\$)	U (\$)	S (\$)	M (\$)	U (\$)	S (\$)	M (\$)	
Utility	320	160*	80	700	350	175	800	400	200	1,820.00
Design	220	110	55	160	80	40	640	320	160	
Plant	220	110	55	440	220	110	660	330	165	
Reissue	320	160	80	700	350	175	2,320	1,160	580	
Provisional	300	150	75	0	0	0	0	0	0	

* The \$160 small entity status filing fee for a utility application is further reduced to \$80 for a small entity status applicant who files the application via EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	Undiscounted Fee (\$)	Small Entity Fee (\$)	Micro Entity Fee (\$)
Each claim over 20 (including Reissues)	100	50	25
Each independent claim over 3 (including Reissues)	480	240	120
Multiple dependent claims	860	430	215
Total Claims			
20	-20 or HP = _____ x _____ = _____		
HP = highest number of total claims paid for, if greater than 20.			
Indep. Claims			
3	-3 or HP = _____ x _____ = _____		
HP = highest number of independent claims paid for, if greater than 3.			

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$420 (\$210 for small entity) (\$105 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fees Paid (\$)
_____	_____	_____	_____	_____

4. OTHER FEE(S)

Non-English specification, \$140 fee (\$70 for small entity) (\$35 for micro entity)

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, \$400 fee (\$200 small or micro entity)

Other (e.g., late filing surcharge): Surcharge - late filing of additional _____ \$160.00

SUBMITTED BY

Signature	/Christopher P Harris/	Registration No. (Attorney/Agent)	43660	Telephone	216.621.2234
Name (Print/Type)	Christopher P. Harris	Date	2021-11-30		

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.