TEXAS INSTRUMENTS

AN-1392 LM3485 LED Demo Board

1   Introduction

The LM3485 LED driver board is a buck regulator derived controlled current source designed to drive high power, high brightness LEDs (HBLEDs) such as the Luxeon® Emitter at dissipations of 1W to 5W. The board can accept an input voltage ranging from 5 V to 30 V and can control the output current delivered to series and/or parallel arrays of HBLEDs as long as the forward voltage of all LEDs in series is less than (0.9 x V_{IN}). The accuracy of the output current is ±10%.

2   Setting the LED Current

The forward current IF delivered to the LED array is set by the program jumper, P2. If no jumper is installed, the LM3485 will default to the lowest current setting, 350 mA. Installing a jumper as shown in Figure 1 will change the current regulation point to 700 mA, 100 mA, or 1400 mA, respectively.
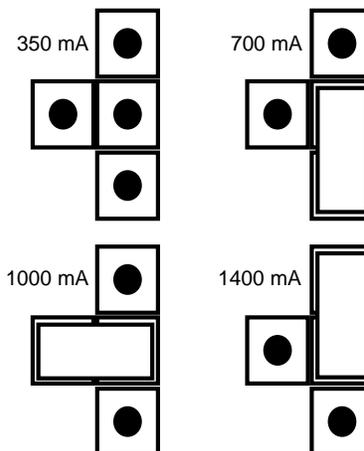
**Figure 1. Current Settings of P2**

3   PWM Dimming

Diode **D2** provides an input for a pulse width modulation signal for dimming of the LED array. In order to fully enable and disable the LM3485 the PWM signal should have a maximum logic low level of 1.0 V, a minimum logic high level of 2.0 V, and minimum low and high periods of 40 μs. For example, at 100Hz, the minimum and maximum duty cycles to which the LM3485 can respond are 0.4% and 99.6%, respectively. At 1 kHz, the minimum and maximum duty cycles are 4% and 96%, respectively.

The logic of the PWM is inverted, hence the LM3485 will deliver regulated output current when the voltage at the PWM IN terminal is low, and the current output is disabled when the voltage at the PWM IN terminal is high. Connecting a constant logic high to the PWM IN will disable the output.

Luxeon is a registered trademark of Philips Lumileds Lighting Company in the United States and other countries.
All other trademarks are the property of their respective owners.

4 Output Open Circuit

With PWM IN floating or connected to logic low, the LM3485 will begin to operate as soon as is has an input of at least 5 V. In the case that the input is powered but no LED array is connected the output voltage will rise to equal the input voltage. The output of the circuit is rated to 30 V and will not suffer damage, however care should be taken not to connect an LED array if the output voltage is higher than the target forward voltage of the LED array in steady state.

5 Typical Application Circuit
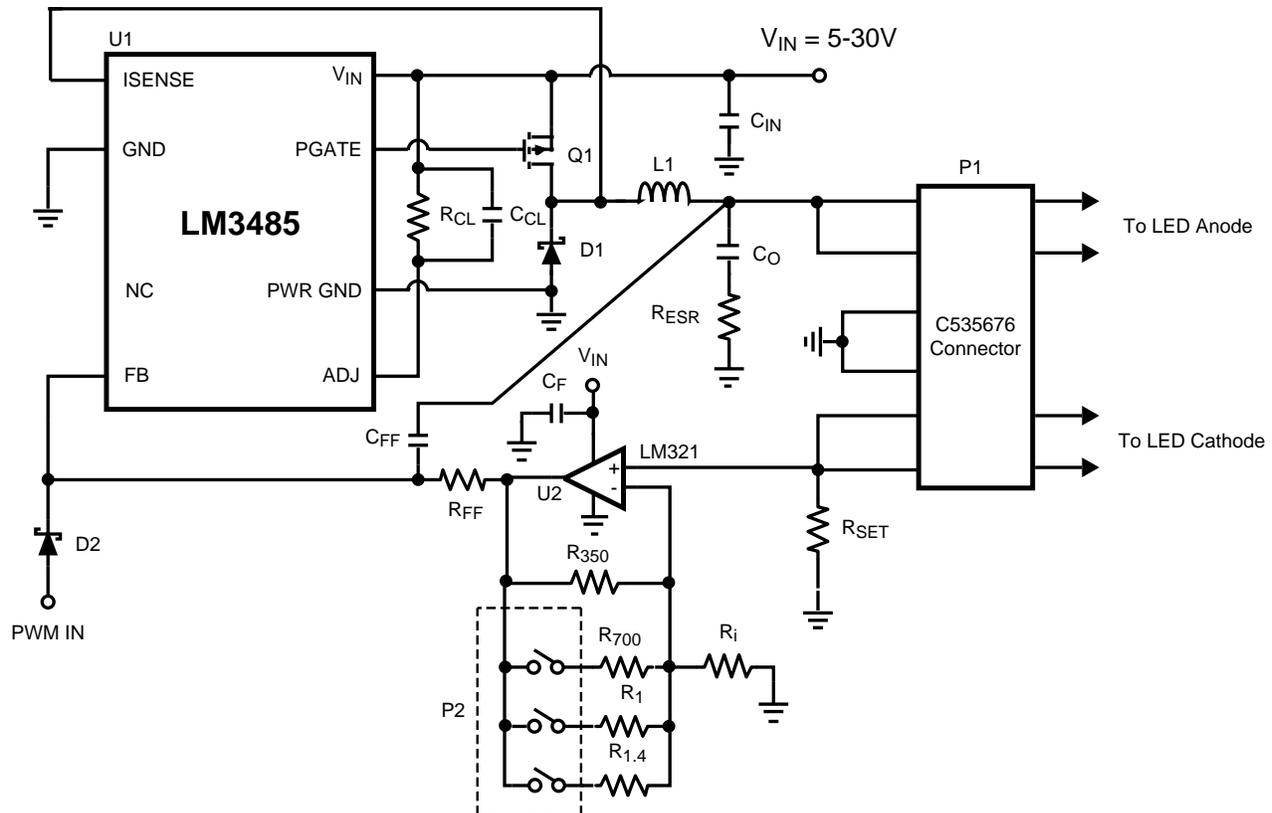
Figure 2. Circuit Schematic

Table 1. Bill of Materials

ID	Part Number	Type	Size	Parameters	Qty	Vendor
U1	LM3485	Hysteretic Controller	VSSOP-8		1	TI
U2	LM321	Op-amp	SOT23-5	1MHz	1	TI
L1	SLF7045T-6R8M1R7	Inductor	7.0x7.0 x4.5mm	6.8 µH, 1.7A	1	TDK
Q1	Si3483DV	PFET	SuperSOT-6	-30 V, 5A	1	Vishay
D1	SS24	Schottky Diode	DO-214A, (SMB)	40 V, 2A	1	Vishay
D2	MBR0520	Schottky Diode	SOD-123	20 V, 0.5A	1	Vishay
Cff	VJ0805Y102KXXAT	Capacitor	0805	1 nF, 10%	1	Vishay
Cf	C2012X7R1H104M	Capacitor	0805	100 nF, 50 V	1	TDK
Ccl	VJ0805A101KXXAT	Capacitor	0805	100 pF, 10%	1	Vishay
Cin, Co	C3216X7R1H105M	Capacitor	1206	1 µF 50 V	2	TDK
Rff	CRCW08051002F	Resistor	0805	10 kΩ, 1%	1	Vishay
Resr	CRCW08051R00F	Resistor	0805	1 Ω 1%	1	Vishay
Rcl	CRCW08052552F	Resistor	0805	25.5 kΩ 1%	1	Vishay
Rset	CRCW1206R500J	Resistor	1206	0.5 Ω 5%	1	Vishay
Ri	CRCW08051002F	Resistor	0805	10 kΩ 1%	1	Vishay
R350	CRCW08056192F	Resistor	0805	61.9 kΩ 1%	1	Vishay
R700	CRCW08054422F	Resistor	0805	44.2 kΩ 1%	1	Vishay
R1	CRCW08051962F	Resistor	0805	19.6 kΩ 1%	1	Vishay
R1.4	CRCW08059091F	Resistor	0805	9.09 kΩ 1%	1	Vishay
P1	535676-5	Connector	Custom	6 Pins	1	Tyco/AMP
P2		Connector	Custom		4	AMP

6   PCB Layout Diagram(s)
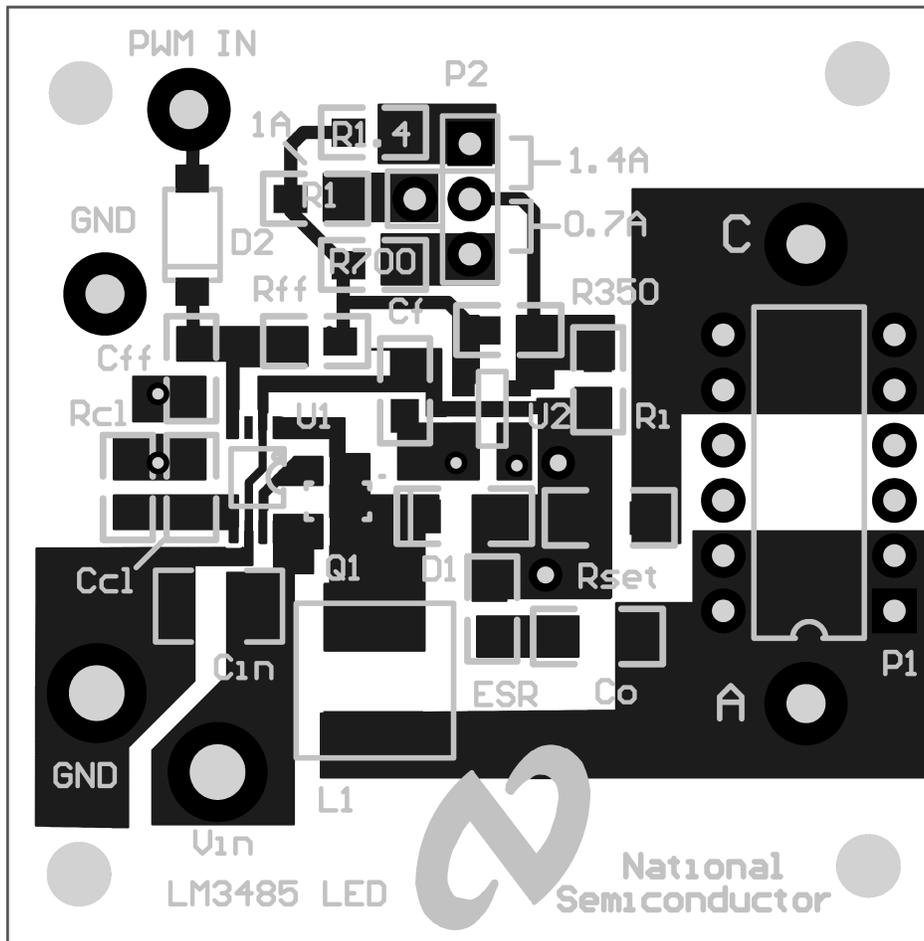
IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have *not* been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		Applications	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated