

General Description

The AL3644 is a dual LED flash driver that provides a high level of adjustability within a small solution size. The AL3644 utilizes a 2-MHz or 4-MHz fixed frequency synchronous boost converter to provide power to the dual 1.5-A constant current LED sources. The dual 128 level current sources provide the flexibility to adjust the current ratios between LED1 and LED2. An adaptive regulation method ensures the current sources remain in regulation and maximizes efficiency.

Features of the AL3644 are controlled via an I²C-compatible interface. These features include: hardware flash and hardware torch pins (STROBE and TORCH/TEMP), a TX interrupt, and an NTC thermistor monitor. The device offers independently programmable currents in each output leg to drive the LEDs in a Flash or Movie Mode (Torch) condition.

The 2-MHz or 4-MHz switching frequency options, overvoltage protection (OVP), and adjustable current limit allow for the use of tiny, low-profile inductors and $(10-\mu F)$ ceramic capacitors. The device operates over a -40°C to 85°C ambient temperature range.

Applications

• Camera Phone White LED Flash

Key Features

- Dual Independent 1.5-A LED Current Source Programmability
- Accurate and Programmable LED Current Range from 1.4mA to 1.5A
- Torch Currents up to 180mA per Channel
- Flash Timeout Values up to 400ms
- Optimized Flash LED Current During Low Battery Conditions (IVFM).
- > 85% Efficiency in Torch Mode (at 100 mA) and Flash Mode (at 1A to 1.5A)
- Grounded Cathode LED Operation for Improved Thermal Management
- Small Solution Size: < 16 mm2
- Hardware Strobe Enable (STROBE)
- Synchronization Input for RF Power Amplifier Pulse Events (TX)
- Hardware Torch Enable (TORCH/TEMP)
- Remote NTC Monitoring (TORCH/TEMP)
- 400-kHz I2C-Compatible Interface
 AL3644 (I2C Address = 0x63)

AL3644EV1 Specifications

Parameter	Value	
Input Voltage	2.7VDC to 5.5VDC	
Number of LEDs	2 Channels,	
	1 LED per Channel	
Maximum Torch	180mA	
current / Channel		
Maximum Flash	1.5A	
current / Channel	1.3A	
XYZ Dimension	70mm x 36mm x 11mm	





Figure 1. Top View

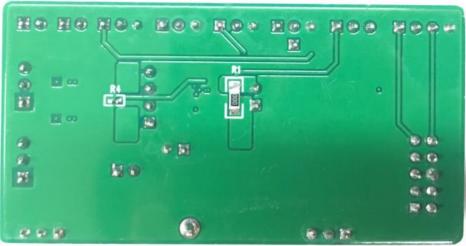


Figure 2. Bottom View

Connection Instructions

USB docking board connection:

Connect one end of the USB docking board to the PC using the supplied USB cable and the other end to J2 of the AL3644EVM using the supplied 10-pin ribbon cable.

Power Supply connection: Connect a DC power supply between J5 and J6



Evaluation Board Schematic

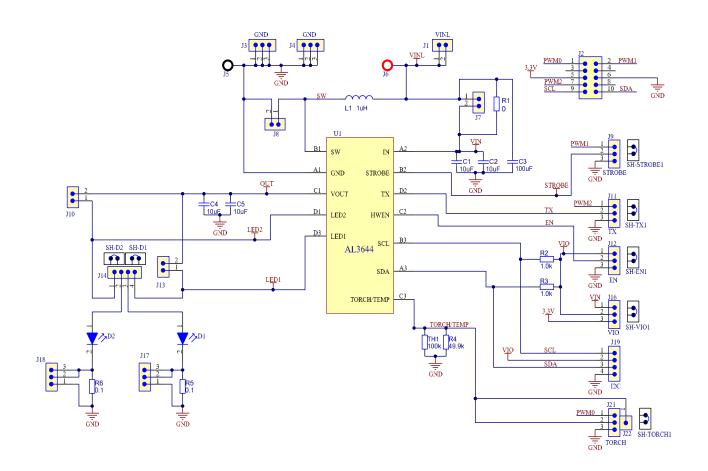


Figure 3. Evaluation Board Schematic



Evaluation Board Layout

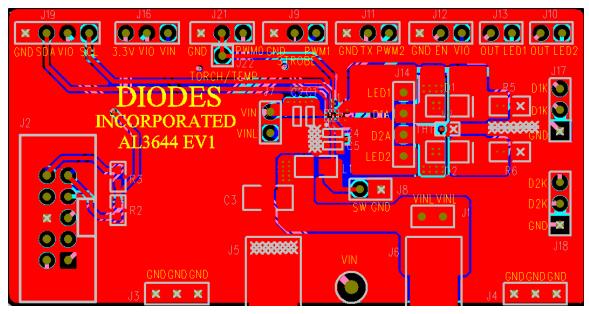


Figure 4. PCB Board Layout Top Layer

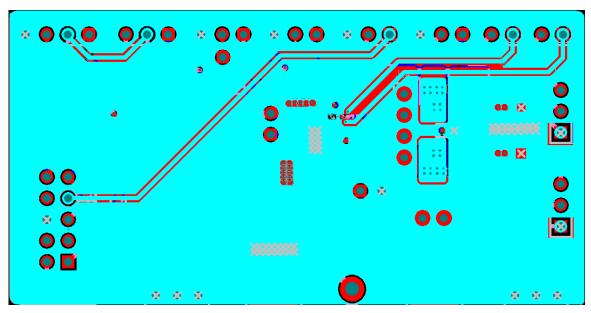


Figure 5. PCB Board Layout Middle Layer 1



Evaluation Board Layout

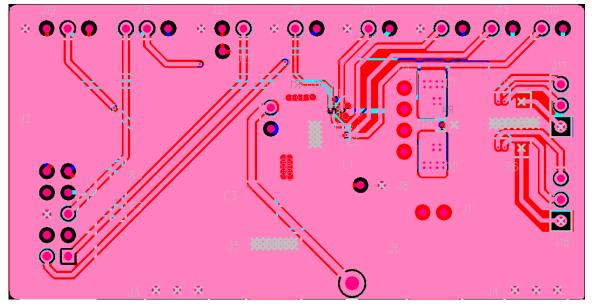


Figure 6. PCB Board Layout Middle Layer 2

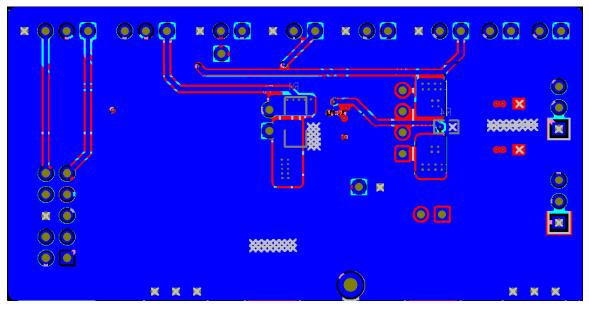


Figure 7. PCB Board Layout Bottom Layer



Bill of Materials

#	Name	Quantity	Package	Description
1	U1	1	U-WLB1713-12	AL3644
2	L1	1	SMD	1uH, 2.5A, 0.063Ω
3	D1, D2	2	SMD	LED, Ultra White
4	C1,C2,C4 ,C5	4	0402	CAP, CERM, 10uF, 6.3V, +/-20%, X5R
5	C3	1	1206	CAP, CERM, 100uF, 6.3V, +/-20%, X5R
6	R1	1	1206	RES, 0Ω, 5%
7	R2,R3	2	0603	RES, 1.0kΩ, 5%
8	R4	1	0402	RES, 49.9kΩ, 1%
9	R5,R6	2	0805	RES, 0.1 ohm, 5%
10	TH1	1	0402	Thermistor NTC, 100k ohm, 5%

Quick Start Guide

- 1. Connect one end of the USB docking board to the PC using the supplied USB cable and the other end to J2 of the AL3644EVM using the supplied 10-pin ribbon cable.
- 2. Open the interface program
- 3. Connect the power supply between J5 and J6 and turn on the power supply.
- 4. Run the software as explained in the I²C-Compatible Interface Program and Operation section.



I²C-Compatible Interface Program and Operation

Diodes Incorporated has created an I²C-compatible program and USB docking board that can help exercise the part in a simple way. Contained in this document is a description of how to use the interface software.

The I2C-compatible interface program provides all of the control that the AL3644 part requires. For proper operation, the USB docking board should be plugged into the PC before the interface program is opened. Once connected, and the program is executed, a basic interface window will open. The image below shows the default settings.

Regifivent Engli	Reg:0x01 Enable register Standby										
TX Pin	Strobe Type	Strobe Pin	Torch / NTC Pin	M1 M	0 LED2	LED1	WRITE	AL3644Kit			
ENABLED	LEVEL	DISABLED	DISABLED	0 0	OFF	OFF	80	IN CORPORATED			
Reg: 0x02 IFVM Register							Sezial Number: 0 Firmware version: 0,0,0,0 AL3	644			
UVLO	IVFM LEVE	a. IVFN	f Hyst	IVFM MO	DE		WRITE	I2C Communication Slave 63 Internal 01 bytes to READ/VRITE	1		
DISABLED	"000"-2.9V		·	1"-Ramp/Hold			01	DATA: FF READ	WRITE		
							01	Status	,		
Reg:OxO3 LED 1	Flash Register					_		Online Write address:01 is success			
LED2Override					BRC#-	63	WRITE	Reg:OxOC Device ID			
ILED1=ILED2		LED1 Flash Brig	chtness		Diode Current	749.59mA	BF	ID 00 REV 02	READ		
Reg:OxO4 LED2 1	Flash Register							Reg:OxO9 Torch/Temp Register			
		U			BRC#-	63	WRITE	Touch polasity NTC open NTC short NTC thusedhold Touch/Temp WRITE			
		LED2 Flash Brig	chtness		Diode Current	749.59mÅ	3F	ACTIVE HIGH DISABLED "100"-600mV TORCH 08			
Reg:OxO5 LED1 1	Forch Register							Reg:OxOA and OxOB FLAG1 and FLAG2 Register			
LED2Overnide	Ů	0			BRC#-	63	WRITE	TX INT OUT SHORT LED I SHORT LED 2 SHORT TEMP TRIP			
ILED1=ILED2		LED1 Torch Bri	ohtness		Diode Current	89.78mA	BF	ICL TSD UVLO TIMEOUT			
Reg:0x06 LED2 1		DDD1 TOIMDIQ	5101000		Disto Culton		Di		IAD		
Neg:UXUO LLUZ .	lorch Kegister					63		Reg:OxOD Last flash register			
				1.1.1	BRC#-		WRITE	LED1 Cument: Off LED2 Cument: Off 00 R	EAD		
		LED2 Torch Bri	ghtness		Diode Current	89.78mÅ	3F	Read/Write Reg Data			
Reg:OxO7 Boost	Config Register								AD		
Software Reset	LED Sho	ort Boo	ost Mode	FSW		ICL	WRITE		UTE		
RESET	ENABLE	D	ORMAL	2Mbz		2.8A	09	Ext Stude 100 ms.			
Reg:OxO8 Timin;	Reg:0x08 Timing Config Register						Touch Enable				
Touch Ramp Time Flash Time-out Timer WRITE						IR Stude 30 hz Duty(%) 15 🛖 Peniod : 33.333ms, Width : 5ms					
"001"- 1 ms	➡ "1010"-1.	50 ms •	•				1A	Tx Enable 200 hz Duty(%) 10 Period : 5ms, Width : 0.5ms			

Figure 8. AL3644 General User Interface (GUI)

The "I²C Interface" fields may be used to write or read any AL3644 register. Selecting the "RESET" button resets all registers to their default values and updates all GUI fields.



Figure 9. I²C interface Fields



1. User Interface

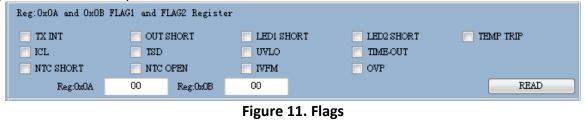
The AL3644 GUI provides the user with access to all of the registers found on the device. Through a combination of buttons, drop-down boxes and sliders, the user can configure the AL3644 to perform in the desired mode. Please note that no data is written to the device until the Write button found within the corresponding register is pressed.

Reg: OxO1 Enable register	644Kit			
	044KI			
ENABLED LEVEL DESABLED D O OFF OFF 80 Seial Number: 0 Firmwae vession: 0.0.0	AL3644			
Reg: 0x02 IFVM Register I2C Communication	AL3044			
UVLO IVFM LEVEL IVFM Hyst IVFM MODE WRITE Slave 63 Internal 01	bytes to READ/WRITE 1			
DESABLED 1000"-2.97 V OmV 101"-RampHold V Ol DATA: FF	READ WRITE			
Reg. Oxf3 LED 1 Flash Register Status	Status			
LED2Override BRC# 63 WRITE Online Frite address:01 is success	🔽 onErrorRere			
Reg(OnOC Device ID				
Difference	READ			
Reg:Ox04 LED2 Flash Register Reg:Ox09 Torch/Temp Register				
	ch/Temp WRITE			
LED2 Flash Brightness Diode Current 749.59nA 3F	ORCH 08			
Reg: OxO5 LED1 Torch Register Reg: OxOA and OxOB FLAG1 and FLAG2 Register				
LED2Overnide BRC#- 63 WRITE TX INT OUT SHORT LED1 SHORT LED2 SHO	-			
LED1 Torch Brightness Diode Current 89.78mA BF NTC SHORT NTC OFEN IVFM OVP	1			
Reg:0x06 LED2 Torch Register Reg:0x06 00 Reg:0x08 00	READ			
BRC#- 63 WRITE Reg:OxOD Last flash register				
LEDI Cusent Off LEDI Cusent Off	00 READ			
LED2 Touch Brightness Diode Current 89.78mA 3F Read/Write Reg Data				
Reg:0x07 Boost Config Register 0x07 Boost Config Register 0x07 Boost Config Register 0x07 Boost Config Register	0x0C 0x0D READ			
Software Reset LED Short Boost Mode FSW ICL WRITE 80 01 BF 3F BF 3F 09 1A 08 00 00	02 00 WRITE			
RENET ENABLED NORMAL 2M0z 28A 09 Ext Stude 100 ms.				
Reg:OxO8 Timing Config Register Touch Enable				
Torch Ramp Time Flash Time-out Timer WRITE IR Stude 30 hz Duty(%) 15 🚆 Period : 33.333ms, Width : 5m	15			
"001"- 1 ms ▼ "1010"-150 ms ▼ 1010"-150 ms ■ 100 ms ■ 100 ms ■ 100 ms				

Figure 10. Write Buttons

2. Flags

The contents of the AL3644 fault registers are read upon clicking the "Read Flags" button. The registers are cleared upon read back.





3. I/O Pin Controls

The AL3644EVM provides the user with the capability to control the TORCH, STROBE and TX inputs without the need of an external supply.

The Ext. Strobe Button toggles the Strobe pin high for the duration entered in the field next to the button.

The Torch Enable button toggles the AL3644's TORCH/TEMP pin high when pressed and low depressed.

The IR Strobe Button along with the hz and Duty fields generate a continuous pulse train that can be used to generate a current pulse pattern on the enabled LEDs.

The TX Enable Button along with the hz and Duty fields generate a continuous pulse train when pressed.

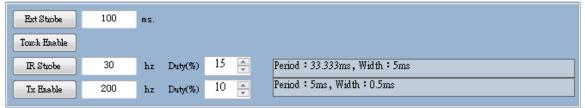


Figure 12. I/O Pin Controls



IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products or systems.

Copyright © 2019, Diodes Incorporated

www.diodes.com