

General Description

The PAM2841 is a step-up current mode LED Driver. The PAM2841 supports a range of input voltages from 2.5V to 5.5V, allowing the use of a single Li+/Li- polymer cell, 3AA cell battery, USB, and other stand-alone power sources. PAM2841 employs internal power switch to minimize external components count and yield a high efficiency (~80%).

A bill of material, schematics, and layout are included that describes the parts used on this demonstration board along with measured performance characteristics. These materials can be used as a reference design.

Key Features

- Capable of Driving 10 or More WLEDs
- Chip Enable with Soft-Start
- Analog and PWM Dimming
- Efficiency up to 80%
- Low Quiescent Current
- 1MHz Fixed Frequency
- Under-Voltage Lockout
- Open/Short Protection
- Thermal Shutdown

Applications

- WLED Driver System

PAM2841EV1 Specifications

Parameter	Value
Input Voltage	2.5 to 5.5Vdc
LED Current	20mA (Adjustable)
Number of LEDs	10
XYZ Dimension	2.2" x 1.1" x 0.4"

Evaluation Board

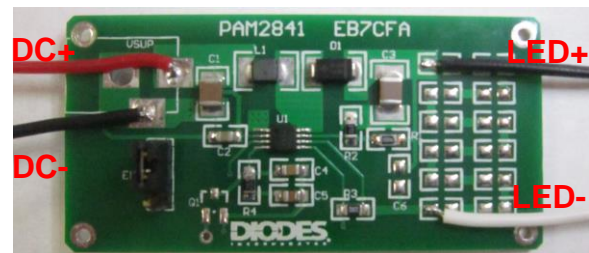


Figure 1: Top View

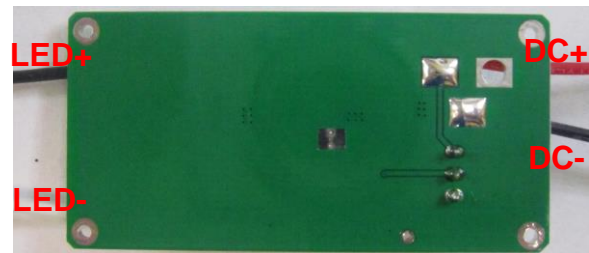


Figure 2: Bottom View

Connection Instructions

Input Voltage: 2.5 to 5.5Vdc (DC+, DC-)
 LED Outputs: LED+ (Black), LED- (White)

Evaluation Board Schematic

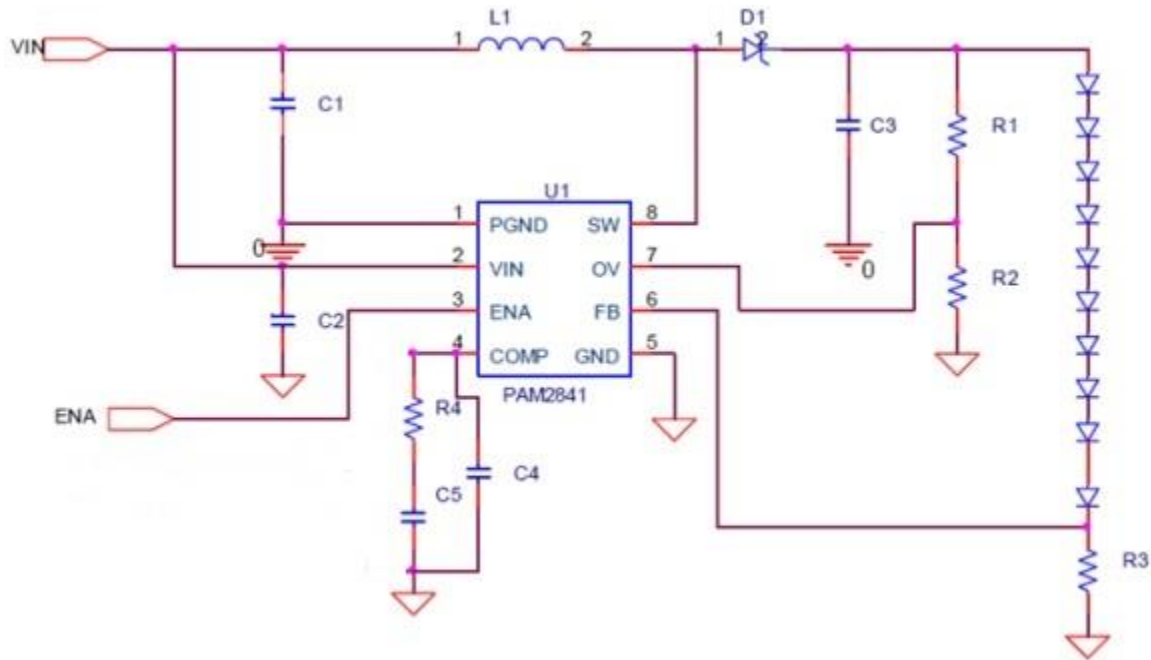


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

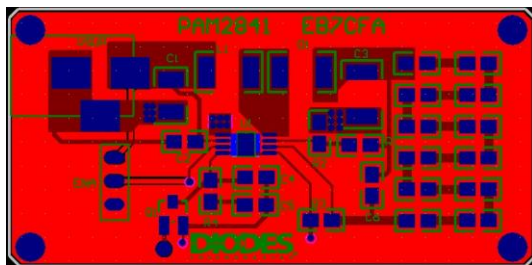


Figure 4: PCB Layout Top View

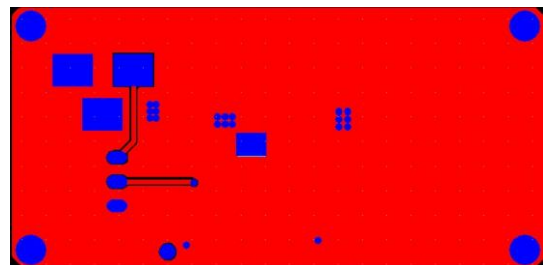


Figure 5: PCB Layout Bottom View

Quick Start Guide

1. By default, the evaluation board is preset at 20mA LED Current by R3 (10 Ohm).
2. Ensure that the DC source is switched OFF or disconnected.
3. Connect the 2.5 to 5.5Vdc DC line wires of power supply to DC+ and DC- on the board.
4. Connect the anode wire of external LED string to LED+ output test point.
5. Connect the cathode wire of external LED string to LED- output test point.
6. Turn on the main switch. LED string should light up.

Bill of Material

#	Name	Quantity	Part number	Manufacturer	Description
1	IC1	1	PAM2841	Diodes Inc	LED Driver MSOP-8
2	C1	1	GRM21R71C106B	Murata	10 μ F Cer Cap 10V 10% X5R 1210
3	C2	1	GRM21R71C105B	Murata	1 μ F Cer Cap 10V 10% X5R 0805
4	C3	1	GRM21R71C105B	Murata	1 μ F Cer Cap 50V 10% X5R 1210
5	C4	1	GRM21R71C103B	Murata	10nF Cer Cap 10V 10% X5R 0805
6	C5	1	GRM21R71C102B	Murata	1nF Cer Cap 10V 10% X5R 0805
7	R1	1	RC0805JR-07910KL	Yageo	910k Ω Resistor 1/8W 5% 0805 SMD
8	R2	1	RC0805JR-0727KL	Yageo	27k Ω Resistor 1/8W 5% 0805 SMD
9	R3	1	RC0805JR-0710RL	Yageo	10 Ω Resistor 1/8W 1% 0805 SMD
10	R4	1	RC0805JR-072KL	Yageo	2k Ω Resistor 1/8W 5% 0805 SMD
11	L1	1	LQH32CN220K	Murata	22 μ H, 1A Inductor 1210
12	D1	1	ES11QS04	Nihon	1A Schottky diode 1210 SMD
13	PCB	1	PAM2841 EB7CFA		

Functional Performance (10 LEDs @20mA)

V _{in} (DC)	P _{in} (W)	V _{out} (V)	I _{out} (mA)	P _{out} (W)	Efficiency (%)	# of LEDs
2.5	0.888	26.76	19.84	0.531	59.80	10
3	0.753	26.76	19.66	0.526	69.86	
3.5	0.717	26.76	19.97	0.534	74.52	
4	0.701	26.76	19.99	0.535	76.31	
4.5	0.683	26.76	20.05	0.537	78.56	
5	0.682	26.76	20.05	0.537	78.67	
5.5	0.685	26.76	20.16	0.540	78.79	

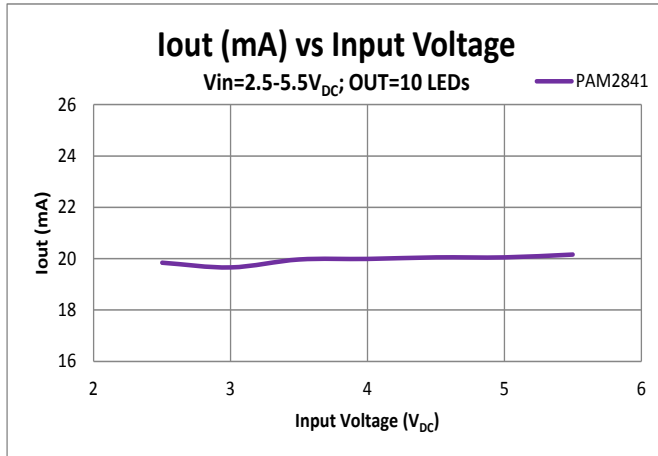


Figure 6 Vin (DC) vs. Iout (mA)

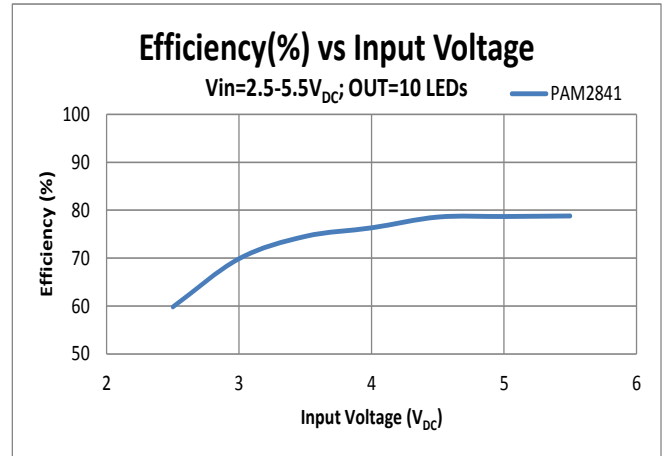


Figure 7 Vin (DC) vs. Efficiency (%)

Application Information

Setting the Output Current:

The internal feedback (FB) voltage is 0.2V (Typical). The output current is calculated as below:
 $I_{LED} = 0.2/R_3$

The output Current is given by the following table.

R3(Ω)	I _{LED} (mA)
10	20
6.8	30
5.1	40

As the input voltage approaches the LED forward voltage, the PAM2841 turns the P-Channel transistor continuously on. In this mode the Voltage drop on LED is equal to the input voltage minus the voltage drop across the P-Channel transistor, Inductor and current resistor:

$$V_{LEDDROP} = V_{IN} - I_{LED}(R_{DS(ON)} + R_L + R_S)$$

where $R_{DS(ON)}$ = P-Channel switch ON resistance, I_{LED} = LED current, R_L = Inductor DC Resistance, R_S = Inductor DC Resistance.

Thermal Shutdown

When the die temperature exceeds +150°C, a reset occurs and the reset remains until the temperature decrease to +120°C, at which time the circuit can be restarted.

PCB Layout Guidelines

Decoupling Capacitors

(1) The capacitors (C2) need to place very close to the PAM2841's pins.

Grounding

(1) The decoupling capacitors C2, C4 should each to be grounded to analog ground AGND;

(2) The capacitors C1, C3, R2 and R3 should each be grounded to power ground PGND;

(3) Connect the AGND and PGND islands by connecting the GND pins directly to the exposed backside pad. Make no other connections between these separate ground planes.

Others

(1) Connect L1, SW, D1, C3 with short and wide connections;

(2) Place the OVP voltage setting-divider resistors (R1, R2) as close to the OV pin as possible. The divider's center trace should be kept short;

(3) Minimize the size of the SW node while keeping it wide and short. Keep the SW node away from the feedback node and ground;

(4) Place the FB resistor (R3) as close to the FB pin as possible.

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