

General Description

The AL3066 is a high efficiency 4-channel boost controller for WLED backlight applications. It operates over a wide input voltage ranged from 4.5V to 33V.

The current of the 4 channels is simply programmed from 20mA to 400mA with an external resistor. The current match between any channel is $\pm 1.5\%$ (typical). Its operating frequency can be adjusted from 0.1MHz to 1MHz.

The AL3066 can support two dimming modes: direct PWM dimming, PWM to analog dimming.

Robust protection features include cycle by cycle current limit, soft-start, UVLO, programmable OVP, OTP, open/short LED protection, Schottky Diode Short and Open Protection, Inductor Short-Circuit Protection and V_{OUT} Short protection.

Applications

- LCD Monitor
- LCD Display Module
- LCD TV

Key Features

- Input Voltage Range: 4.5V to 33V
- Drivers up to 4 Strings in Parallel, 250mA per String, 400mA Pulse Current
- $\pm 3\%$ Current Precision
- Low Ripple for Low BOM Cost
- 4KV HBM ESD Class
- High Voltage Pins CS and OVP for Safety Test
- Support Direct PWM dimming, PWM to Analog Dimming
- Minimum PWM Dimming Duty Cycle can be 1/10,000 at 100Hz Dimming Frequency
- LED Open/Short Protection
- Schottky Diode/Inductor Short-Circuit Protection
- Built-in OCP, OVP, OTP, UVLO, V_{OUT} Short/Schottky Diode Open Protection

AL3066EV1 Specifications

Parameter	Value
Input Voltage	24VDC
LED Current	120mA * 4Channel
Number of LEDs	19 LEDs in series per string, 4 strings
XYZ Dimension	96mm x 55 x 18mm

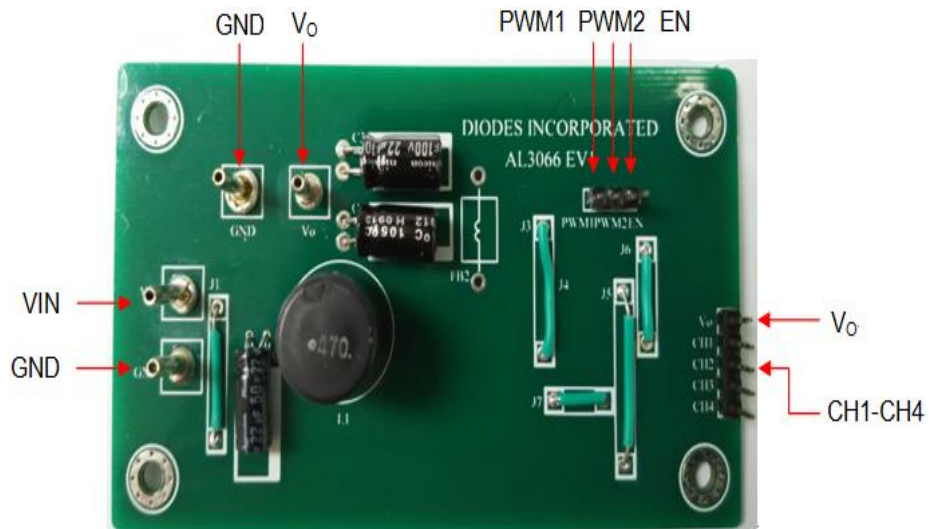


Figure 1: Top View

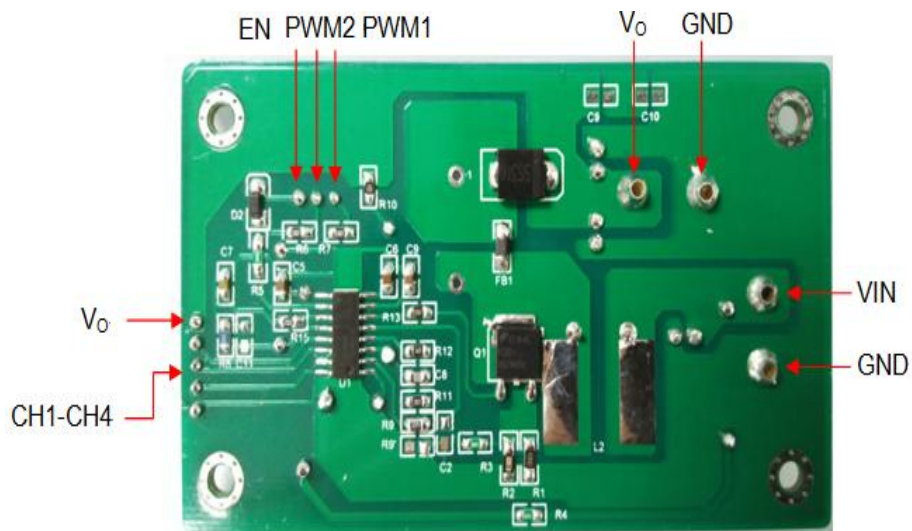


Figure 2: Bottom View

Connection Instructions

- Power Supply Input: 24Vdc (VIN, GND)
- Enable Signal Input: 5Vdc (EN, GND)
- PWM Signal Input: (PWM1, GND)
- PWM to Analog dimming Signal Input: (PWM2, GND)
- LED Outputs: LED+ (Vo), LED- (CH1~CH4)

Evaluation Board Schematic

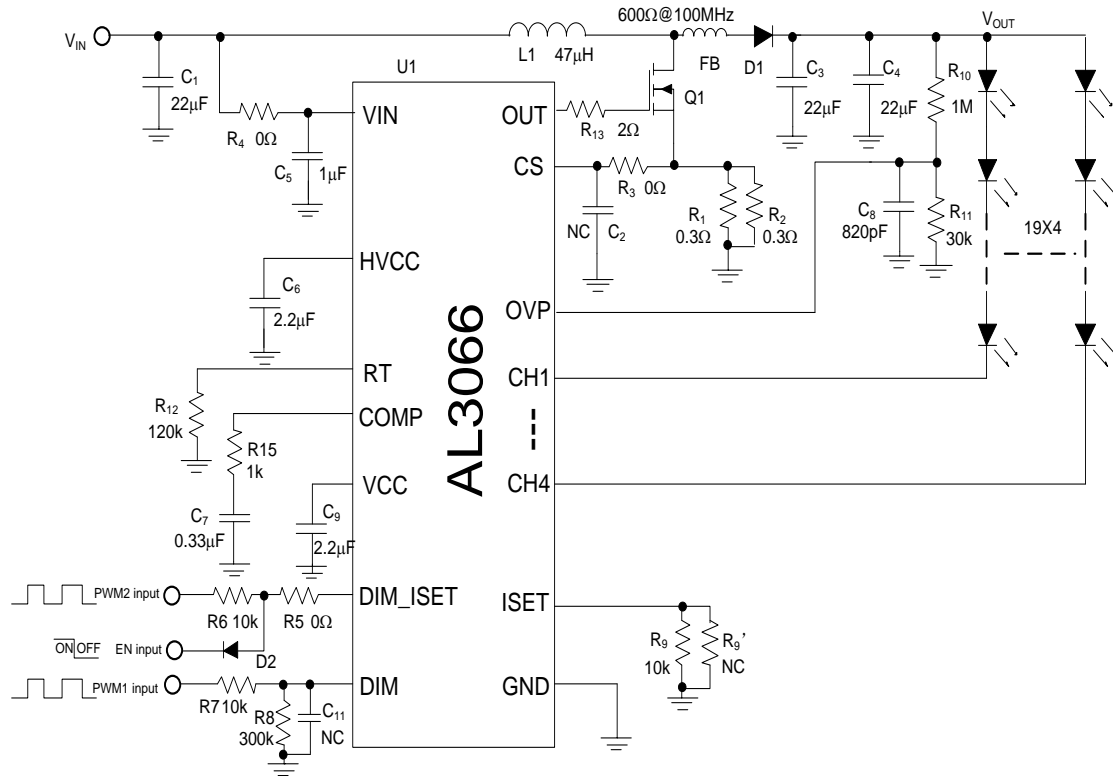


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

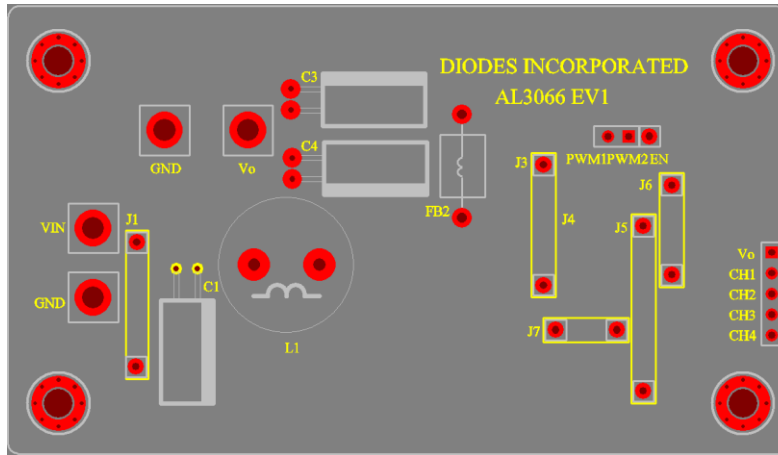


Figure 4: PCB Board Layout Top View

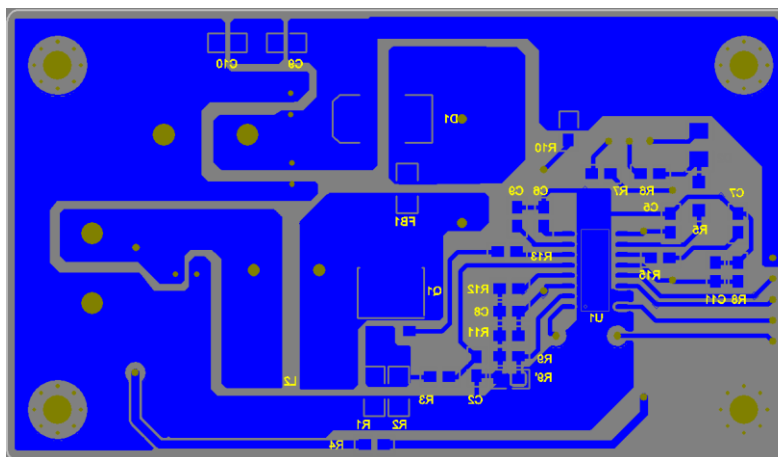


Figure 5: PCB Board Layout Bottom View

Quick Start Guide

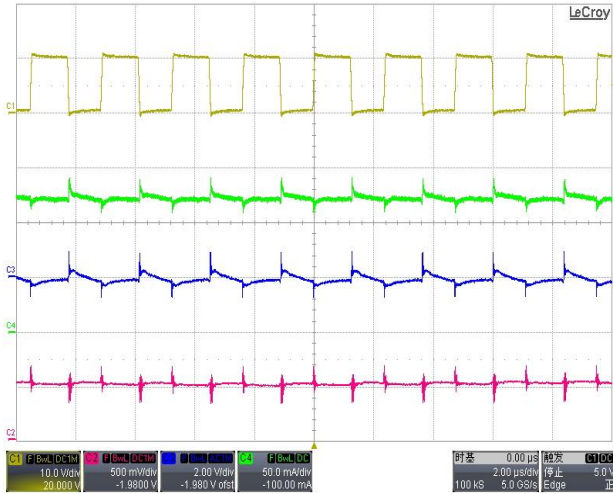
1. By default, the evaluation board is preset at 120mA LED Current per channel by R9.
2. Connect the anode wire of external LED string to Vo pin.
3. Connect the cathode wire of external LED string to CH1~CH4 pins.
4. Power Supply: Apply 24V_{DC} to Vin & GND pin to supply AL3066
5. Enable the IC: Apply 5 V_{DC} to EN & GND pin to enable the circuit.
6. Dimming mode selection:
 - 1) Direct PWM dimming:
Apply a synchronal PWM signal (V_{pp}=5V) to PWM1 & GND pin to dim the LEDs.
 - 2) PWM to Analog dimming:
Apply a synchronal PWM signal (V_{pp}=5V) to PWM2 & GND pin to dim the LEDs.
7. LED string should light up after 4~6 steps.

Bill of Material

#	Name	Quantity	Package	Description
1	U1	1	SOP-16	AL3066
2	L1	1	DIP-2	47uH/3A
3	Q1	1	TO-252(DPAK)	100V/7.7A; ZXMN10A09K
4	D1	1	SMC	100V/3A; B3100
5	C1	1	Φ6	22uF/50V
6	C3,C4	2	Φ6	22uF/100V
7	D2	1	SOD123	1N4148W
8	R1,R2	2	1206	300mΩ, 5% Precision
9	R3,R4,R5	3	0805	0Ω, 5% Precision
10	R6,R7	2	0805	10kΩ, 5% Precision
11	R8	1	0805	300kΩ, 5% Precision
12	R9	1	0805	10kΩ, 1% Precision
13	R10	1	0805	1MΩ, 5% Precision
14	R11	1	0805	30kΩ, 5% Precision
15	R12	1	0805	120kΩ, 5% Precision
16	R13	1	0805	2Ω, 5% Precision
17	R15	1	0805	1kΩ, 5% Precision
18	C5	1	0805	1uF/50V, Ceramic X7R
19	C6,C9	1	0805	2.2uF/16V, Ceramic X7R
20	C7	1	0805	0.33uF/16V, Ceramic X7R
21	C8	1	0805	820pF/16V, Ceramic X7R
22	FB	1	1206	30Ω@100M Hz, AEM:MCP1206F300PT-T

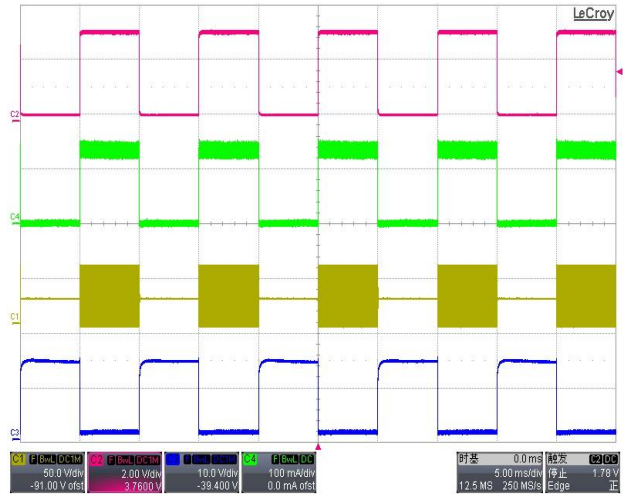
Functional Waveforms

V_{OUT} **I_{CH}** **V_{O(ac)}** **V_{CH}**



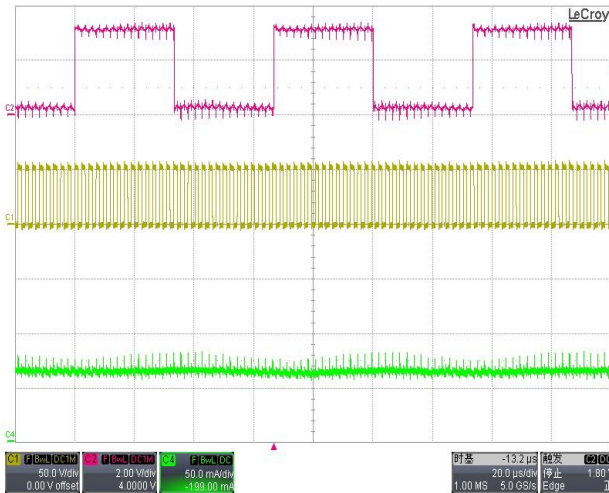
Operation Waveform (100%Duty)

V_{PWM1} **I_{CH}** **V_{SW}** **V_{CH}**



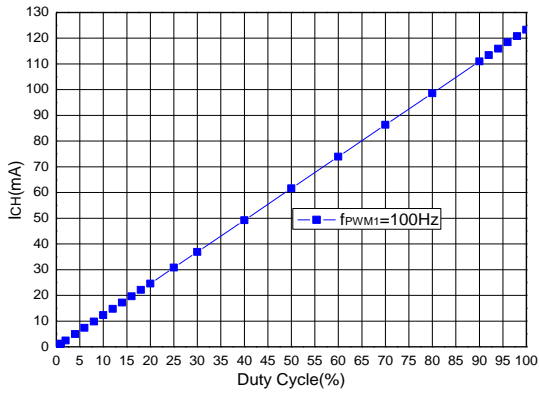
Direct PWM dimming (f_{PWM1}=100Hz ,50%Duty)

V_{PWM2} **V_{SW}** **I_{CH}**

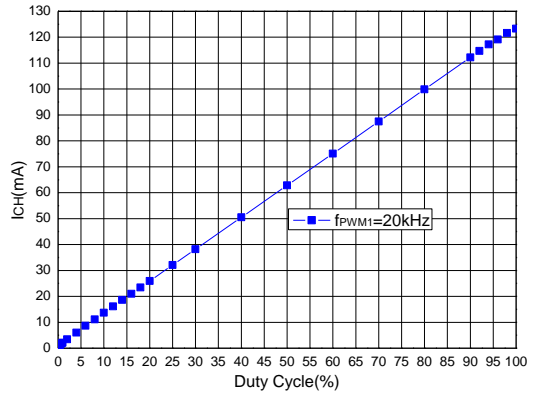


PWM to Analog dimming (f_{PWM2}=15kHz, 50%Duty)

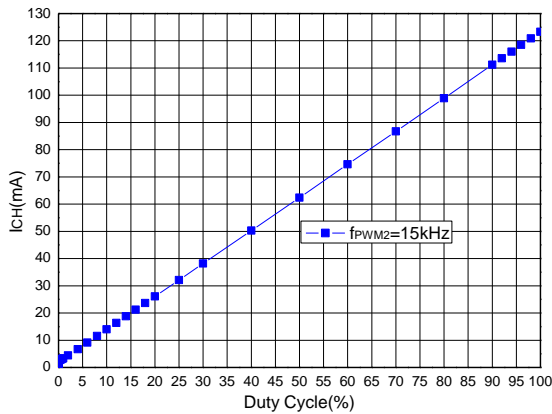
Functional Data Curves



**Direct PWM dimming (fPWM1=100Hz)
Channel Current VS Duty cycle**



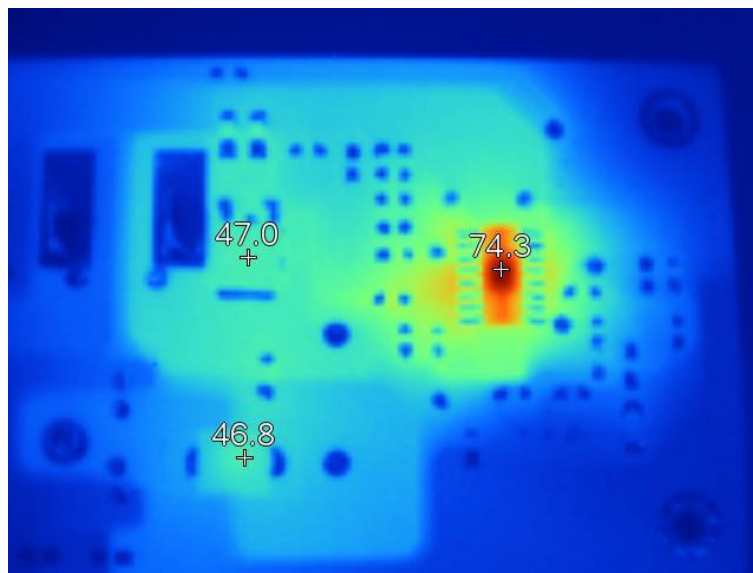
**Direct PWM dimming (fPWM1=20kHz)
Channel Current VS Duty cycle**



**PWM to Analog dimming
Channel Current VS Duty cycle**

Efficiency and Thermal Test

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency (%)	Power Mos Temp(°C)	Diode Temp(°C)	IC Temp(°C)
24	1.184	56.41	0.48	95.3	47	46.8	74.3

**Thermal Test of AL3066**

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