AL3065EV1 User Guide

General Description

This demonstration board utilizes the AL3065 high efficiency boost controller with 4-string current sources for driving WLED backlight. The AL3065 operates over a wide input voltage range from 4.5V to 33V.

The current of 4 strings are simply programmed from 20mA to 400mA with an external resistor. The current matching between each string is 1.5% (Typ). Its operating frequency can be adjusted from 0.1MHz to 1MHz, which allows trade-offs between external component size and system efficiency. The AL3065 supports three dimming modes: direct PWM dimming, PWM to analog dimming and DC to analog dimming.

The AL3065 features robust protections 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.

Key Features

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

Applications

- LCD Monitor
- LCD Display Module
- LCD TV

AL3065EV1 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

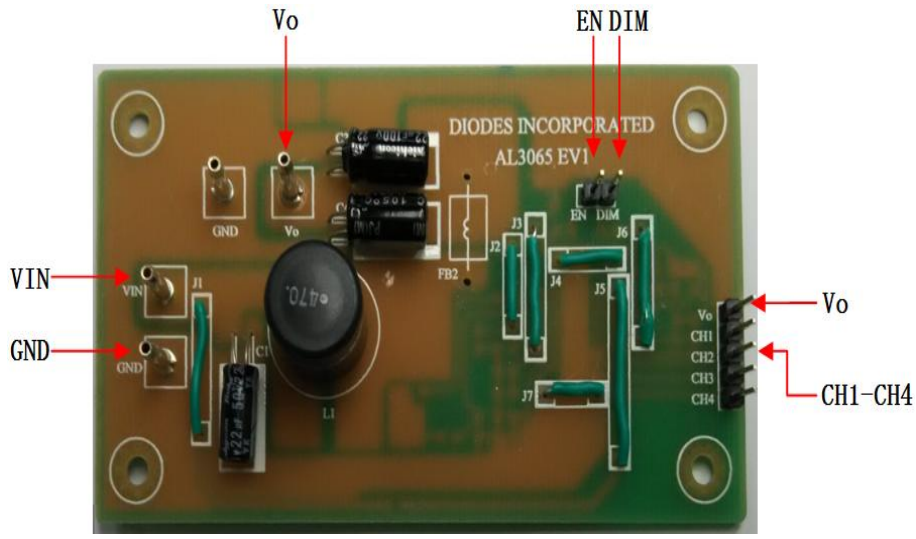


Figure 1: Top View

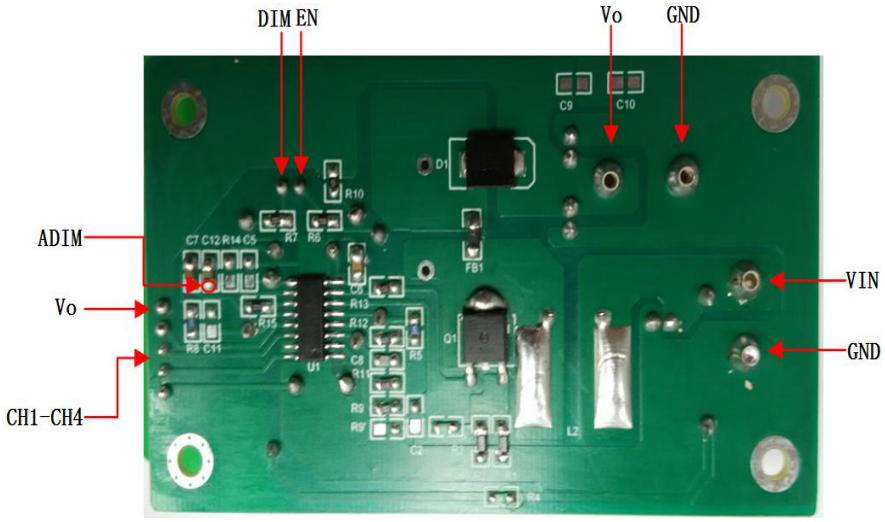


Figure 2: Bottom View

Connection Instructions

Power Supply Input: 24VDC (VIN, GND)
Enable Signal Input: 5VDC (EN, GND)
PWM Signal Input: (DIM, GND)
ADIM Signal Input: 0~1.5VDC (ADIM, GND)
LED Outputs: LED+ (Vo), LED- (CH1~CH4)

Evaluation Board Schematic

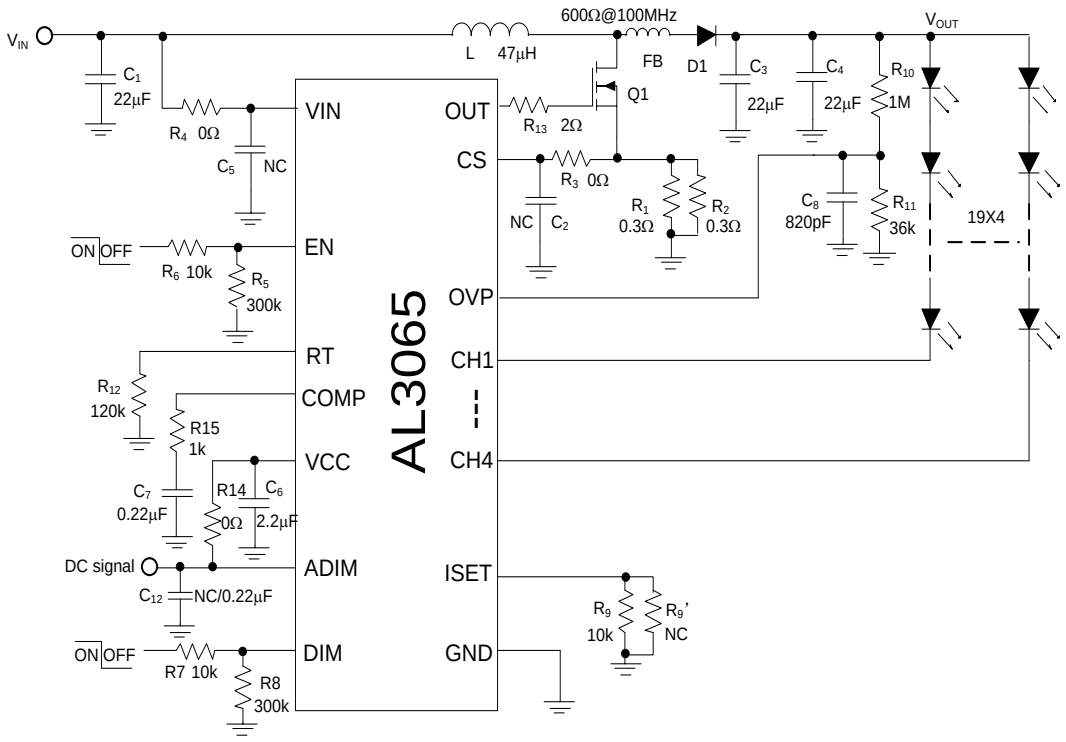


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

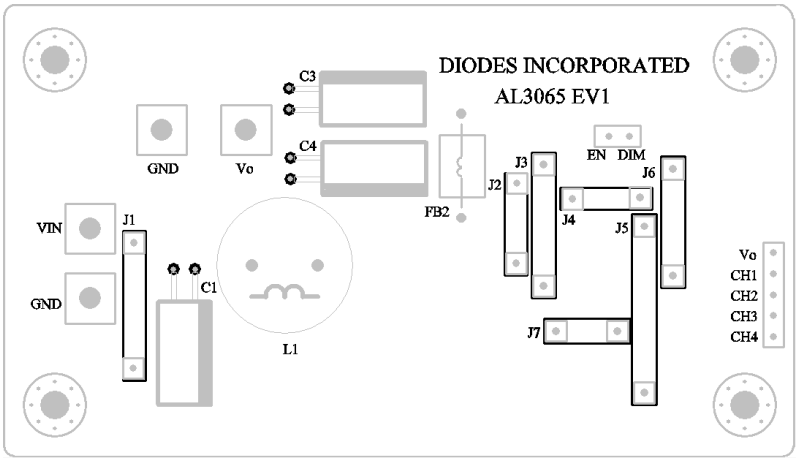


Figure 4: PCB Board Layout Top View

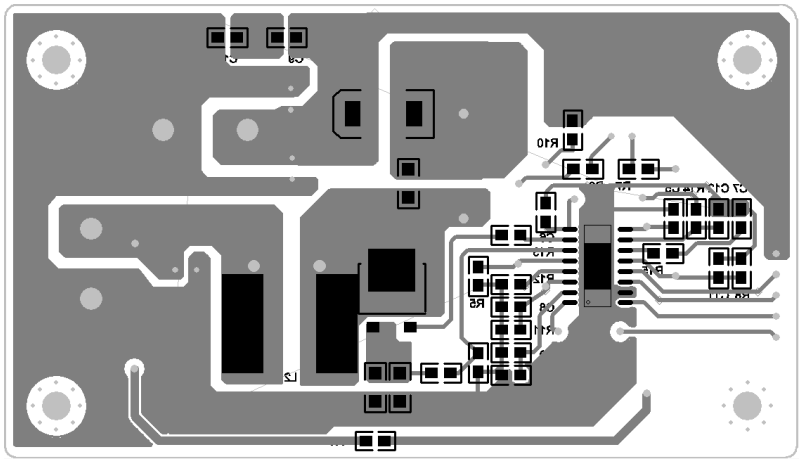


Figure 5: PCB Board Layout Bottom View

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 AL3065
5. Enable the IC: Apply 5 V_{DC} to EN & GND pin to enable the circuit.
6. Dimming mode selection:
   1) Direct PWM dimming:
      a. Connect ADIM pin to VCC pin by R14=0 ohm
      b. Apply a synchronal PWM signal (Vpp=5V) to DIM pin to dim the LEDs.

2) PWM to Analog dimming:
   a. Connect a capacitor from ADIM pin to GND by C12=0.22uF
   b. Apply a synchronal PWM signal (Vpp=5V) to DIM pin to dim the LEDs.
3) DC to Analog dimming:
   a. Apply a DC voltage range from 0~1.5V to ADIM pin to dim the LEDs.

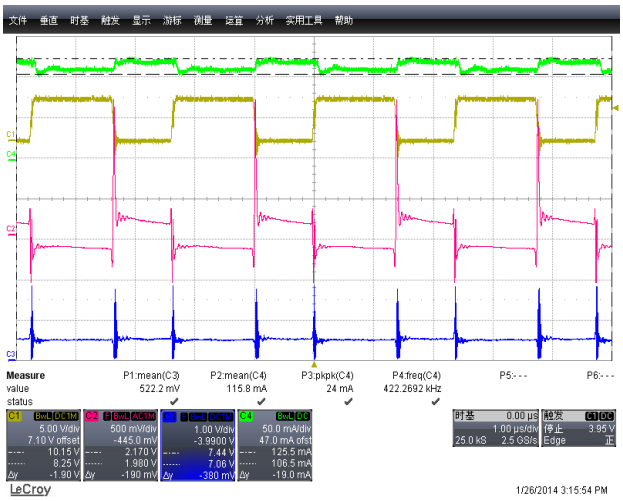
7. LED string should light up after 4~6 steps.

Bill of Material

#	Name	Quantity	Package	Description
1	U1	1	SOP-16	AL3065
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	R1,R2	2	1206	300mΩ, 5% Precision
8	R3,R4	2	0805	0Ω, 5% Precision
9	R5	1	0805	300kΩ, 5% Precision
10	R6,R7	2	0805	10kΩ, 5% Precision
11	R9	1	0805	10kΩ, 1% Precision
12	R10	1	0805	1MΩ, 5% Precision
13	R11	1	0805	30kΩ , 5% Precision
14	R12	1	0805	120kΩ, 5% Precision
15	R13	1	0805	2Ω, 5% Precision
16	R14	1	0805	Direct PWM dimming:0Ω, 5% Precision PWM/DC to Analog dimming: NC
17	R15	1	0805	1kΩ, 5% Precision
18	C6	1	0805	2.2uF/16V, Ceramic X7R
19	C7	1	0805	0.22uF/16V, Ceramic X7R
20	C8	1	0805	820pF/16V, Ceramic X7R
21	C12	1	0805	Direct PWM dimming: NC PWM/DC to Analog dimming: 0.22uF/16V, Ceramic X7R
22	FB	1	1206	30Ω@100M Hz, AEM:MCP1206F300PT-T

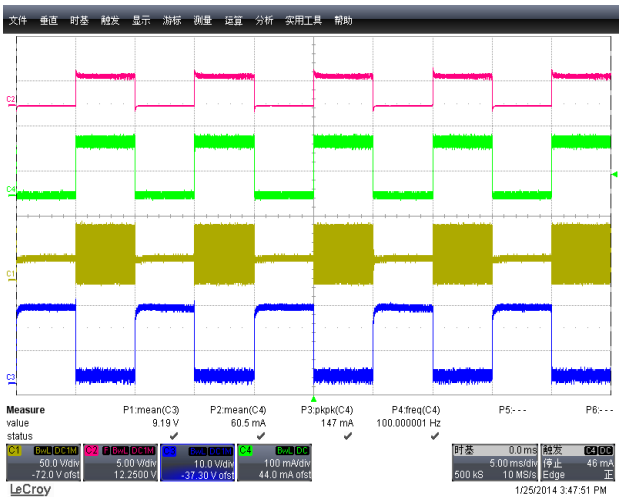
Functional Waveforms

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



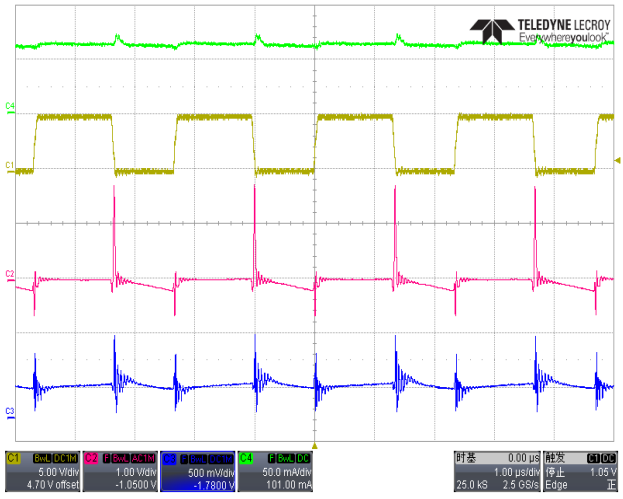
Operation Waveform (100%Duty)

V_{SW} V_{PWM} V_{CH} I_{CH}



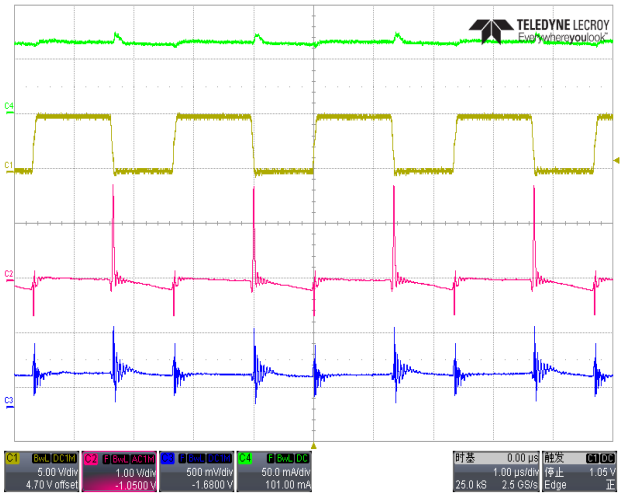
Direct PWM dimming (f_{PWM}=100Hz ,50%Duty)

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



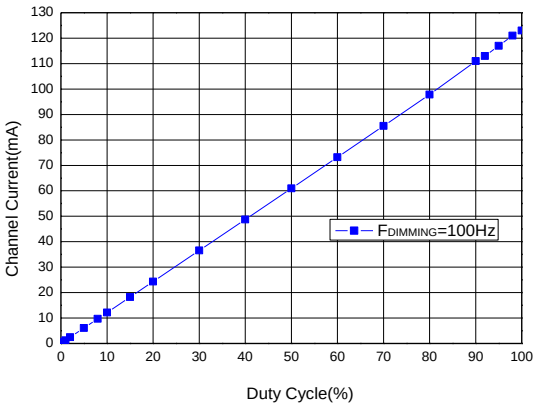
PWM to Analog dimming (f_{PWM}=20kHz, 50%Duty)

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

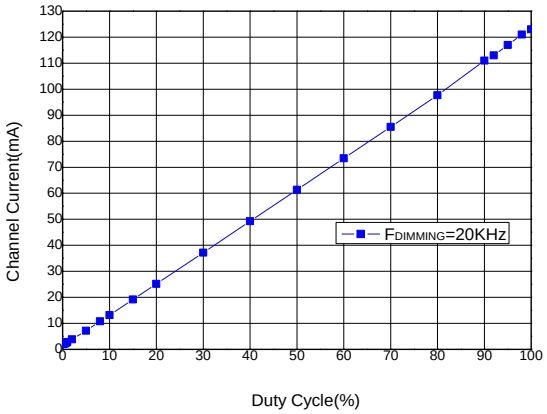


DC to Analog dimming (V_{ADIM}=0.75V)

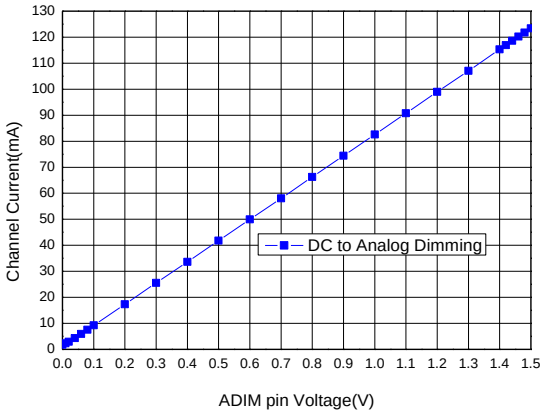
Functional Data Curves



Direct PWM dimming
Channel Current VS Duty cycle



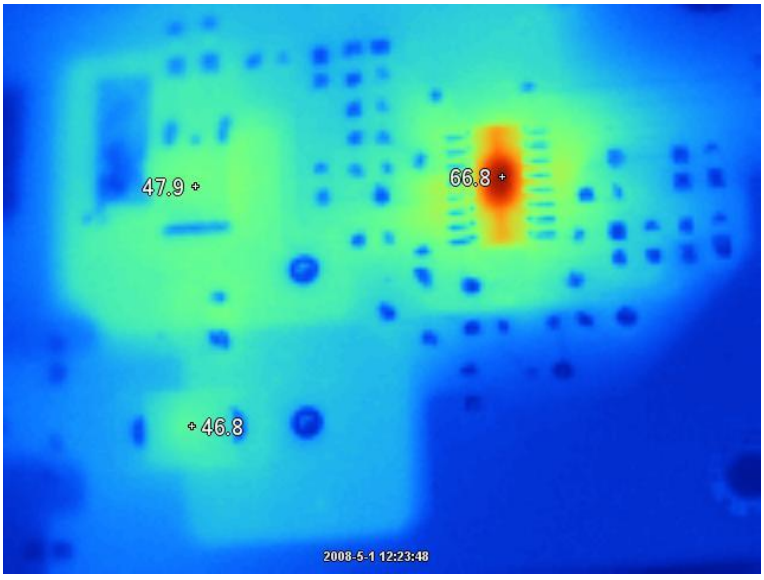
PWM to Analog Dimming
Channel Current VS Duty cycle



DC to Analog dimming
Channel Current VS ADIM pin Voltage

Efficiency and Thermal Test

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency (%)	Power Mos Temp(℃)	Diode Temp(℃)	IC Temp(℃)
24	1.19	56.62	0.48	95.2	47.9	46.8	66.8



Thermal Test of AL3065

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