AL8862FFEV2 User Guide

60V 1A STEP-DOWN LED DRIVER

General Description

The AL8862FF-7 is a step-down DC-DC converter designed to drive LEDs with a constant current. The AL8862FF-7 operates with an input supply voltage from 5V to 60V and provides an externally-adjustable output current up to 1A. Series connection of the LEDs provides identical LED currents, resulting in uniform brightness and eliminating the need for ballast resistors. The AL8862FF-7 switches at frequencies up to 1MHz. This allows the use of smaller-sized external components, hence minimizing the PCB size.

The AL8862FF-7 integrates the power switch and a high-side output current-sensing circuit. Maximum output current of the AL8862FF-7 is set via an external resistor connected between the VIN and SET input pins. Dimming is achieved by applying either a DC voltage or a PWM signal at the CTRL input pin. The soft-start time can be adjusted using an external capacitor from the CTRL pin to ground. An input voltage of 0.3V or lower at CTRL pin will shut down the power switch.

Applications

- Commercial & Industrial Lighting
- Appliances Interior Lighting
- Architecture Detail Lighting
- External Driver with Multiple Channels and smart Lig hting

Key Features

- Wide Input Voltage Range: 5V to 60V
- Output Current up to 1A
- Internal 60V NDMOS Switch
- Typical 4% Output Current Accuracy
- Single Pin for On/Off and Brightness Control by DC Voltage or PWM Signal
- High-Efficiency (Up to 97%)
- LED Short-Circuit Protection
- Inherent Open-Circuit LED Protection
- Current-Sense Resistor Short-Circuit Protection
- Over temperature Shutdown
- Up to 1MHz Switching Frequency
- U-DFN3030-6 Packages Available in Green Molding Compound (No Br, Sb)

AL8862FFEV2 Specifications

Parameter	Value
Input Voltage	5VDC to 60VDC
LED Current	1A
Number of LEDs	1~16 LEDs
XYZ Dimension	90mm x 60mm x 1.6mm

Figure 1: Top View

Figure 2: Bottom View

Connection Instructions

Power Supply Input: 5~60VDC (VIN, GND)
CTRL: Internal voltage ref. pin (2.5V). This pin can be used to achieve dimming and for switching the output current off. Leave floating for normal operation.
PWM Signal Input: Remove C1, apply PWM signal to CTRL (CTRL, GND)
Analog Signal Input: Connect 22nF capacitor to C1, apply analog signal to CTRL (CTRL, GND)
LED +: LED + connects to the external LED anode
LED - : LED - connects to the external LED cathode

Evaluation Board Schematic

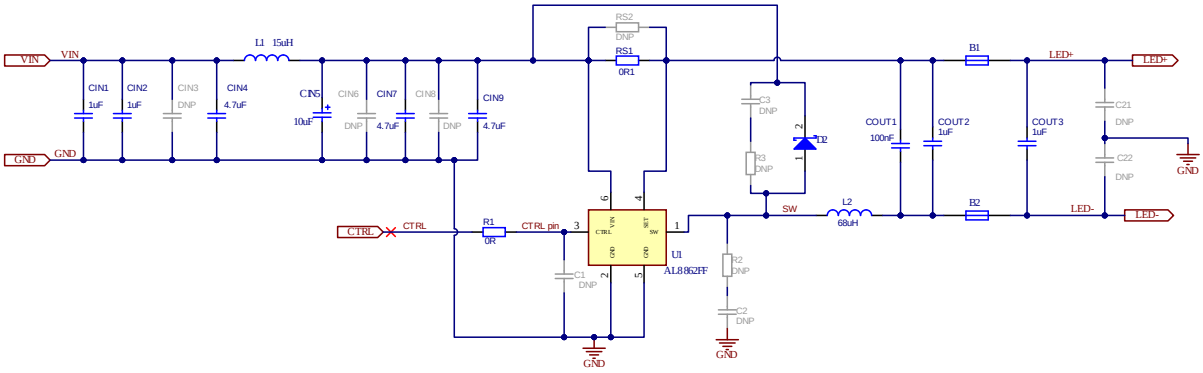


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

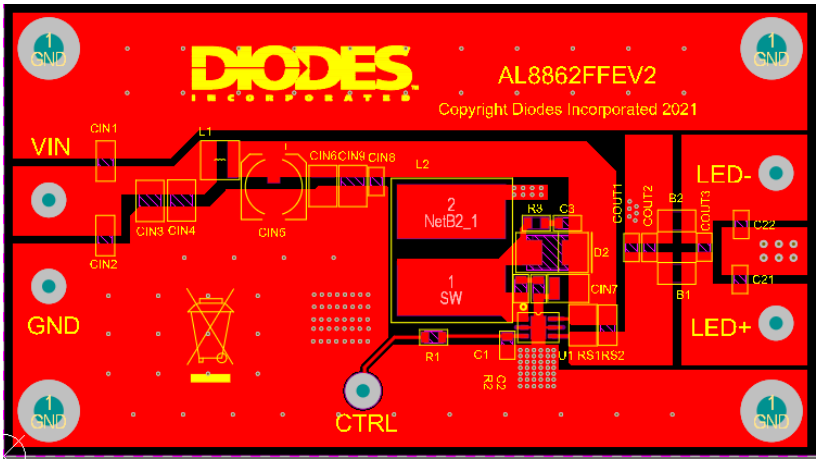


Figure 4: PCB Board Layout Top View

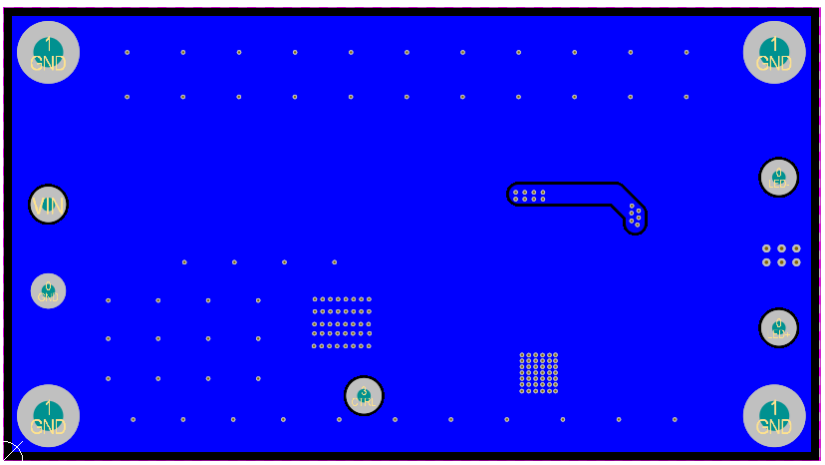


Figure 5: PCB Board Layout Bottom View

Quick Start Guide

1. By default, the evaluation board is preset at 1A LED Current by RS1.
2. Non-dimming operation: Leave CTRL pin floating for normal operation.
3. Power Supply: Connect the 5~60VDC to VIN & GND pin to supply the system and AL8862FF-7.
4. PWM Dimming: Remove C1, apply a PWM signal (low level < 0.3V and high level > 2.6V) to CTRL pin to dim the LEDs. The recommended PWM signal frequency is from 100Hz to 1 kHz, and the PWM duty is from 1% to 100%.
5. Analog Dimming: Connect 22nF capacitor to C1; the CTRL pin may be driven between 0.4V and 2.5V adjusting the output current from 10% to 100% of I_{LED}.

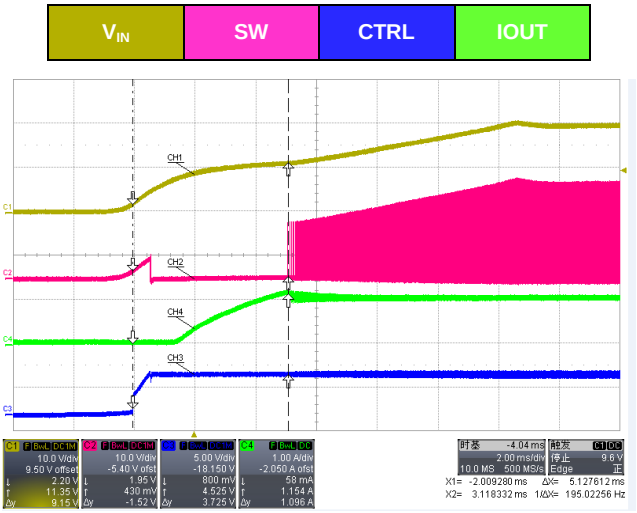
Bill of Material

DESIGNATOR	DESCRIPTION	PACKAGE	MANUFACTURER	PART NO.	QUANTITY
CIN1,CIN2	Ceramic Capacitor, 1uF, 100V, X7R, ±10%	1206	Generic	---	2
CIN4,CIN7,CIN9	Ceramic Capacitor, 4.7uF, 100V, X7R, ±10%	1210	Generic	---	3
CIN5	Electrolytic Capacitor, 10uF, 100V	Ø6.3mm x 8mm	Würth Elektronik	865080845005	1
COUT1	Ceramic Capacitor, 100nF, 100V, X7R, ±10%	0805	Generic	---	1
COUT2,COUT3	Ceramic Capacitor, 1uF, 100V, X7R, ±10%	0805	Generic	---	2
RS1	Resistor, Chip, 0R1,1%,	1210	Generic	---	1
R1	Resistor, Chip, 0R0	0805	Generic	---	1
D2	2.0A HIGH VOLTAGE SCHOTTKY BARRIER RECTIFIER	SMB	Diodes	B2100	1
U1	60V 1A STEP-DOWN LED DRIVER	U-DFN3030-6	Diodes	AL8862FF-7	1
L1	15uH,0.13R,1.45A	4025	Würth Elektronik	74404043150A	1
L2	68uH, ~0.1R, ~1.9A	1050	Würth Elektronik	7447714680	1
B1,B2	EMI 60Ohms,5000mA	1206	Würth Elektronik	7427922	2
VIN,LED+	Connector, Red color	DIP	---	---	2
LED-	Connector, Black color	DIP	---	---	1
GND	Connector, White color	DIP	---	---	1
CTRL	Connector, Orange color	DIP	---	---	1

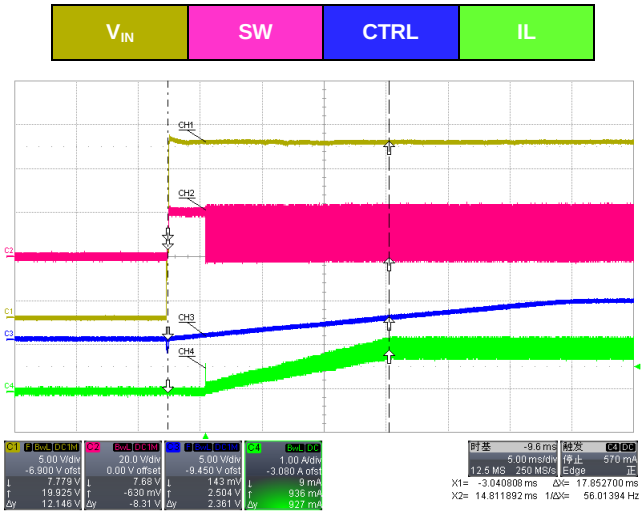
Note: The component part numbers are correct at the time of publication. Diodes Incorporated reserves the right to substitute other parts where necessary, without further notification.

Functional Waveforms

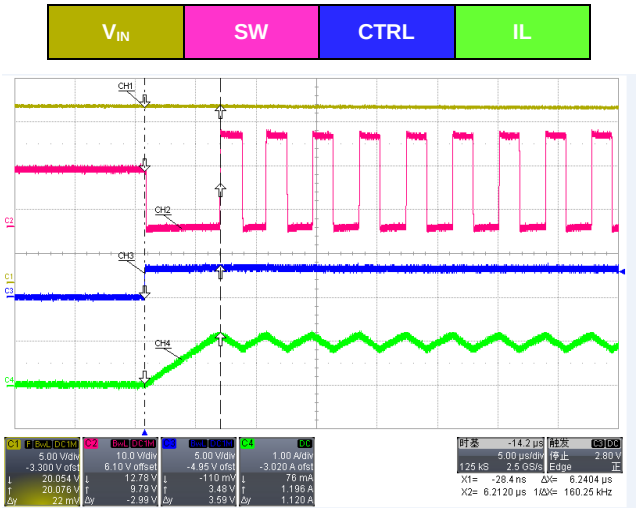
Start-up waveform (Vin=20V, 3LEDs)
Vin Slew Rate=10(V/ms)



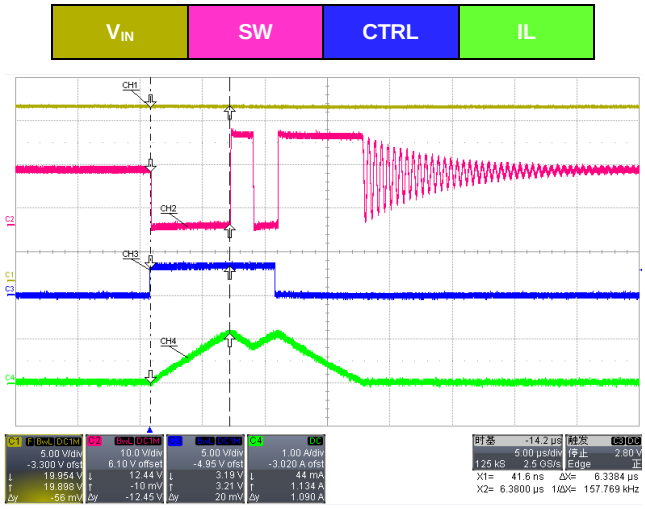
Soft Start waveform
(Vin=20V, 3LEDs, C1=10nF)



Startup waveform under PWM dimming
(Vin=20V, 3LEDs)
(PWM frequency=1KHz, Duty=50%)

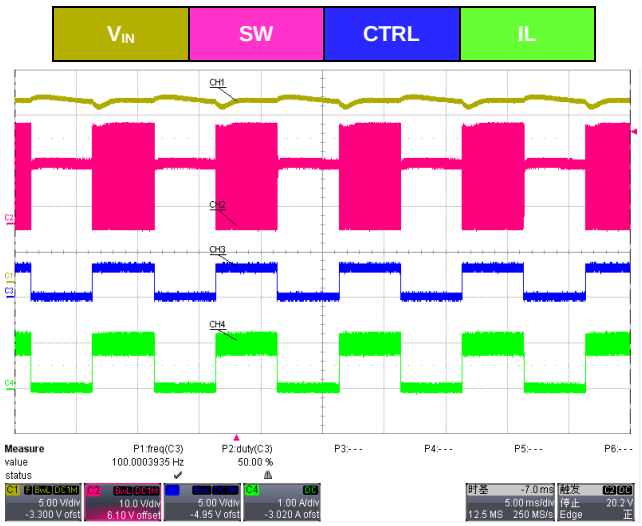


Startup waveform under PWM dimming
(Vin=20V, 3LEDs)
(PWM frequency=10KHz, Duty=50%)

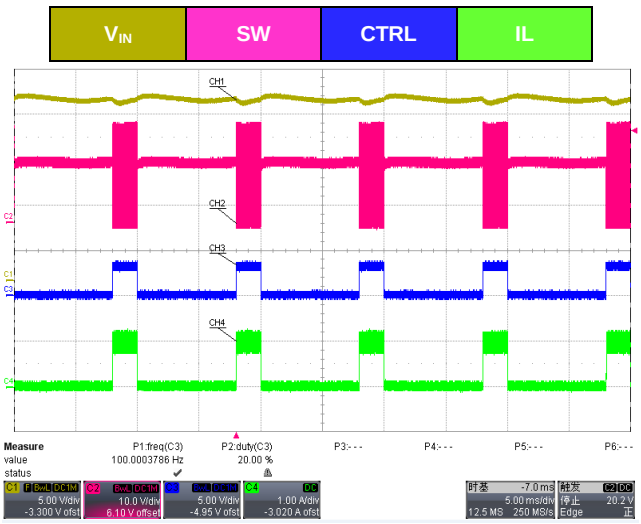


Functional Waveforms

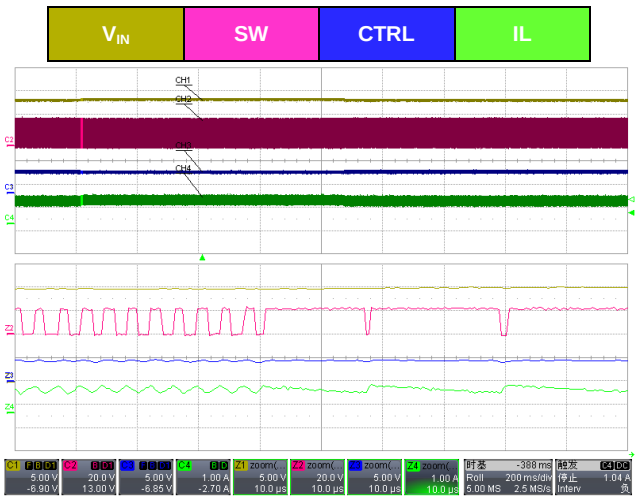
PWM Dimming waveform(Vin=20V, 3LEDs)
(PWM frequency=100Hz, Duty=50%)



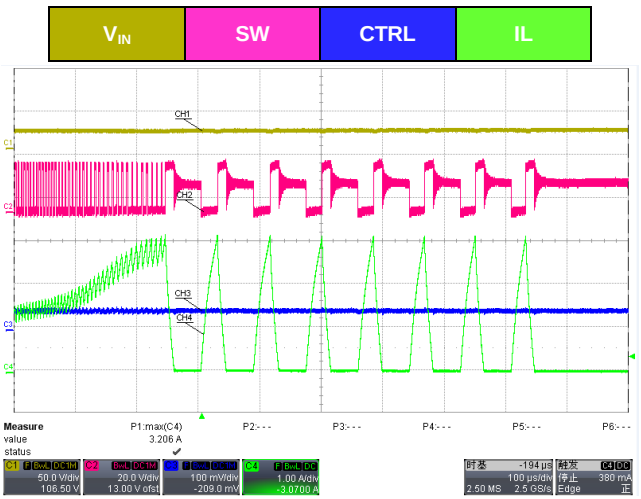
PWM Dimming waveform(Vin=20V, 3LEDs)
(PWM frequency=100Hz, Duty=20%)



Protection_LED short
(Vin=20V, 3LEDs)

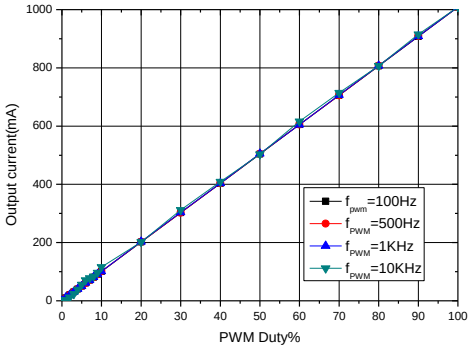


Protection _Rsense short
(Vin=20V, 3LEDs)

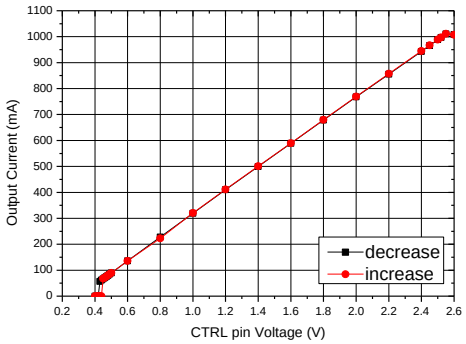


Functional Data Curves

PWM Dimming(Vin=20V, 3LEDs)



Analog Dimming(Vin=20V, 3LEDs)



CISPR15 EMI Performance

Figure 6 presents the EMI performance of the AL8862FFEV2 EVB at 20V input with 3LEDs load. Conducted emissions are measured over a frequency range of 150 kHz to 30 MHz according to the CISPR 15 low-frequency specification. CISPR15 peak and average limit lines are denoted in red. The blue and black spectra are measured using peak and average detection, respectively.

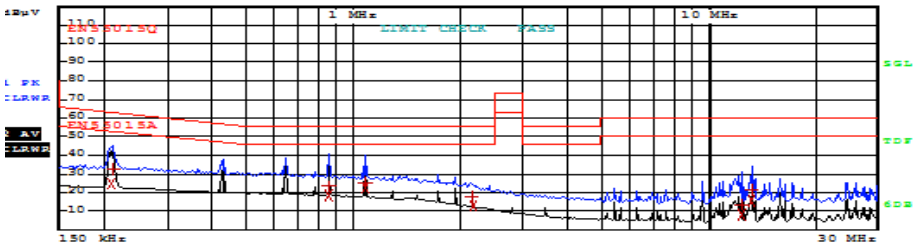


Figure 6: CISPR 15 Conducted Emissions Plot, 150 kHz to 30 MHz, VIN = 20 V, IOUT = 1A, 3LEDs

Thermal Test

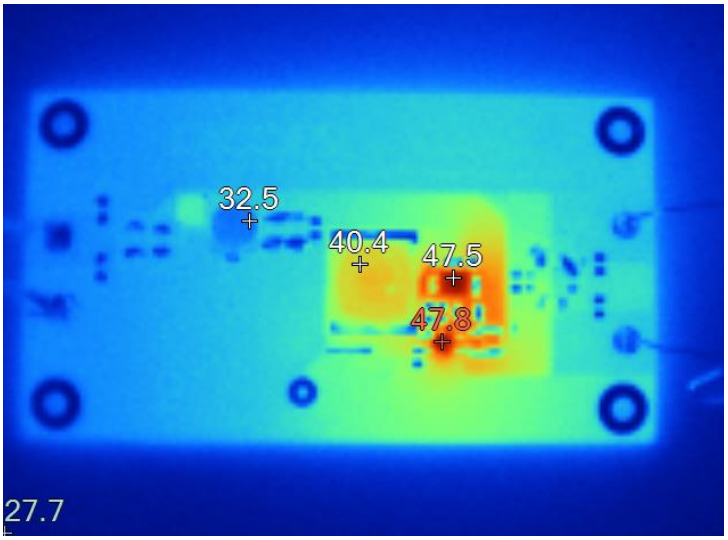


Figure 7: Top (Vin=20V, 3LEDs, Burn-in time=60min)

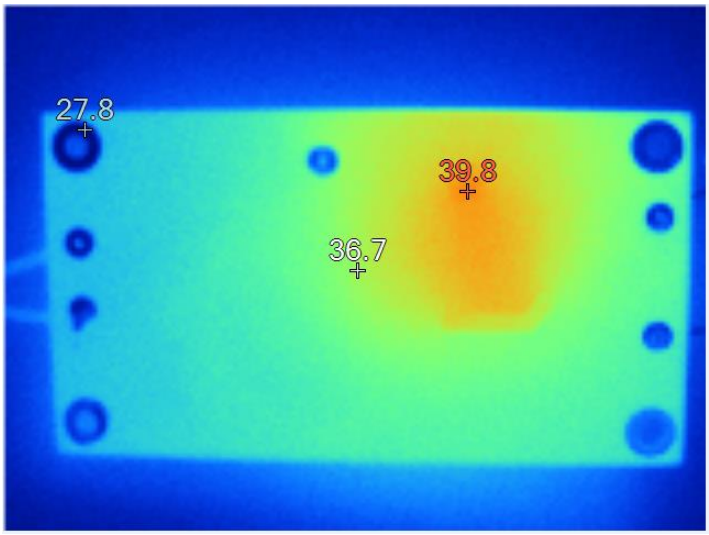


Figure 8: Bottom (Vin=20V, 3LEDs, Burn-in time=60min)

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