

General Description

The AL8843 is a hysteresis mode DC-DC step-down converter, designed for driving single or multiple series connected LEDs efficiently from a voltage source higher than the LED voltage. The device can operate from an input supply between 4.5V and 40V and provide an externally adjustable output current up to 3A. Depending upon supply voltage and external components, this converter can provide up to 60W of output power.

The AL8843 integrates the power switch and a high-side output current sensing circuit, which uses an external resistor to set the nominal average output current.

Dimming can be realized by applying an external control signal to the CTRL Pin. The CTRL Pin will accept either a DC voltage signal or a PWM signal.

The soft-start time can be adjusted by an external capacitor from the CTRL Pin to Ground. Applying a voltage of 0.3V or lower to the CTRL Pin will shut down the power switch.

Applications

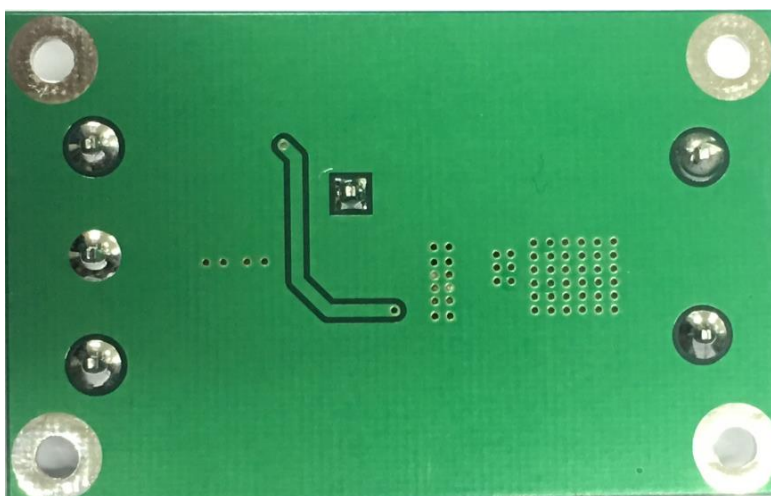
- LED Retrofit for Low Voltage Halogen
- Low Voltage Industrial Lighting
- LED Backlighting
- Illuminated Signs
- External Driver with Multiple Channels

Key Features

- Wide Input Voltage Range: 4.5V to 40V
- Output Current up to 3A
- Internal 40V NDMOS Switch
- Typical 4% Output Current Accuracy
- Single Pin for On/Off and Brightness Control by DC Voltage or PWM Signal
- Recommended Analog Dimming Range: 10% to 100%
- Soft-Start
- High Efficiency (Up to 97%)
- LED Short Protection
- Inherent Open-Circuit LED Protection
- Over Temperature Protection (OTP)
- Up to 1MHz Switching Frequency
- SO-8EP Packages Available in Green Molding Compound (No Br, Sb)

AL8843EV1 Specifications

| Parameter | Value |
|----------------|--------------------|
| Input Voltage | 5VDC to 40VDC |
| LED Current | 2A |
| Number of LEDs | 1~10 LEDs |
| XYZ Dimension | 63mm x 40mm x 10mm |

**Figure 1: Top View****Figure 2: Bottom View**

Connection Instructions

Power Supply Input: 5~40VDC (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 C4, apply PWM signal to CTRL (CTRL, GND)

Analog Signal Input: Connect 470nF capacitor to C4, apply analog signal to CTRL (CTRL, GND)

LED A: LED A connects to the external LED anode

LED K: LED K connects to the external LED cathode

Evaluation Board Schematic

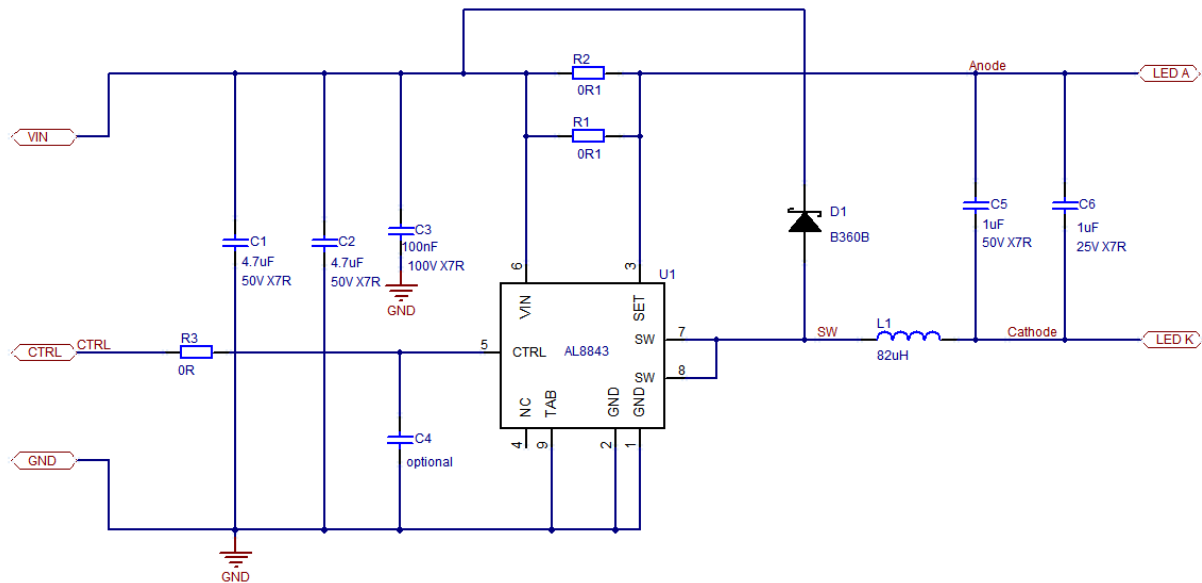


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

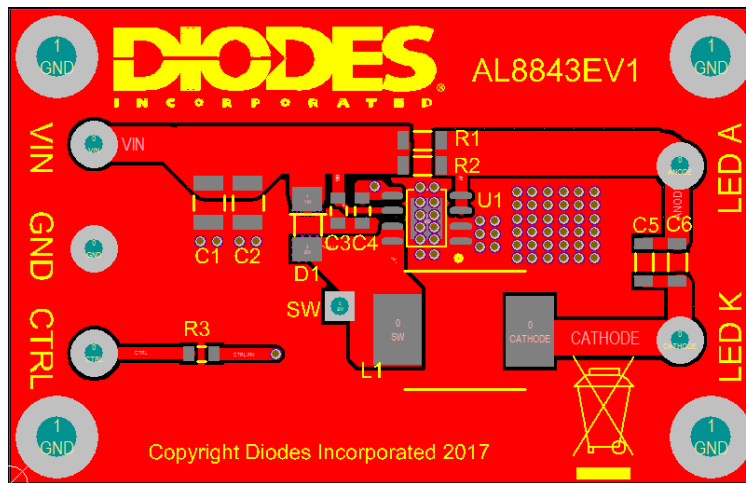


Figure 4: PCB Board Layout Top View

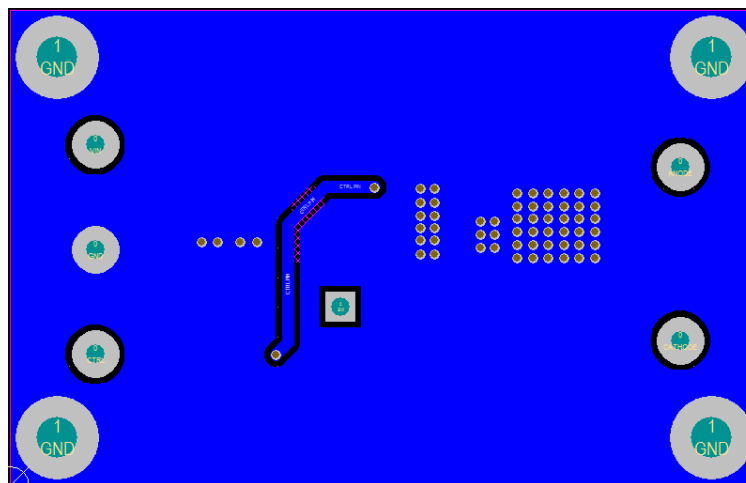


Figure 5: PCB Board Layout Bottom View

Quick Start Guide

1. By default, the evaluation board is preset at 2A LED Current by R1 and R2.
2. Non-dimming operation: Leave CTRL pin floating for normal operation.
3. Power Supply: Connect the 5~40VDC to VIN & GND pin to supply the system and AL8843.
4. PWM Dimming: Remove C4; apply a PWM signal (low level < 0.3V and high level > 2.5) to CTRL pin to dim the LEDs. The recommended PWM signal frequency is from 100Hz to 1kHz, and the PWM duty is from 1% to 100%.
5. Analog Dimming: Connect 470nF capacitor to C4; the CTRL pin may be driven between 0.4V and 2.5V adjusting the output current from 10% to 100% of I_{LED} .

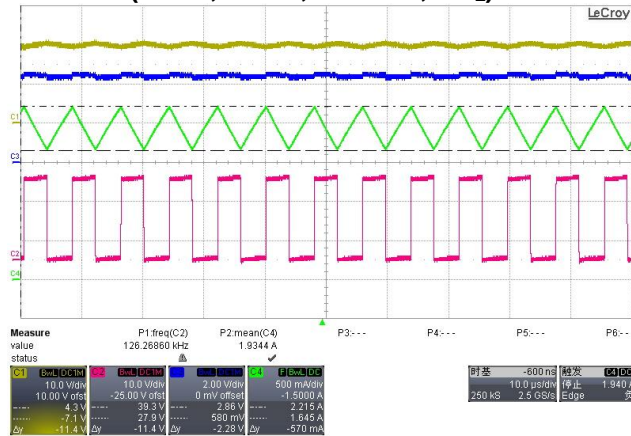
Bill of Material

| Ref | Value | Package | Part Number | Manufacturer | Notes |
|--------|-------------|---------|------------------------------|-------------------|-------------------------------|
| U1 | AL8843 | SO-8EP | AL8843SP-13 | Diodes | DC-DC converter |
| D1 | 60V, 3A | SMB | B360B-13-F | Diodes | Schottky diode |
| R1, R2 | 0R100 | 1206 | | Generic | +/-1% |
| R3 | 0R | 0805 | | Generic | +/-5% |
| C1, C2 | 4.7uF, 50V | 1210 | C1210X475K5RAC | Generic KEMET | X7R |
| C3 | 100nF, 100V | 0805 | Generic NMC0805X7R104K100 | NIC Components | X7R |
| C4 | Not Fitted | 0805 | | | Optional soft start capacitor |
| C5, C6 | 1uF, 100V | 1206 | Generic NMC1206X7R105K100 | NIC Components | X7R |
| L1 | 82uH | 1280 | 744770182 | Würth Elektronik | 82uH, ~0.16R, ~2.45A |

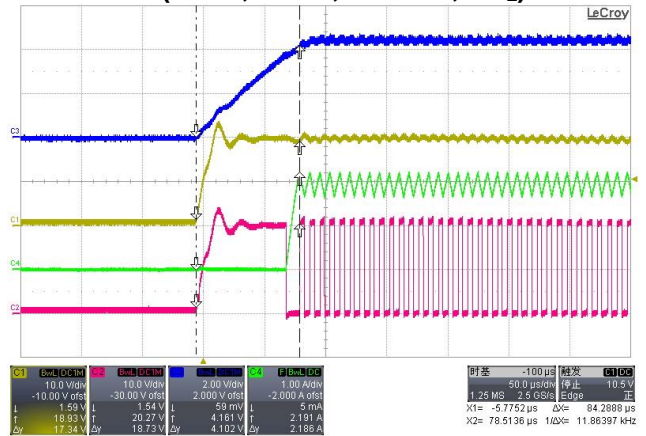
Note: The component part numbers are correct at the time of publication. Diodes Inc reserves the right to substitute other parts where necessary, without further notification.

Functional Waveforms

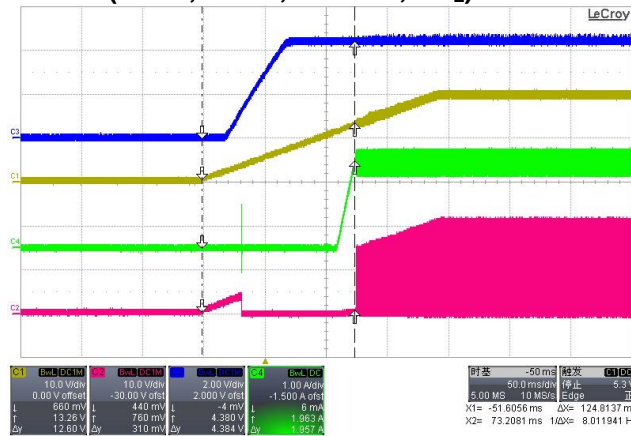
Switching waveform(Vin=20V, 3LEDs)
(Y-Vin, R-SW, B-CTRL, G-I_L)



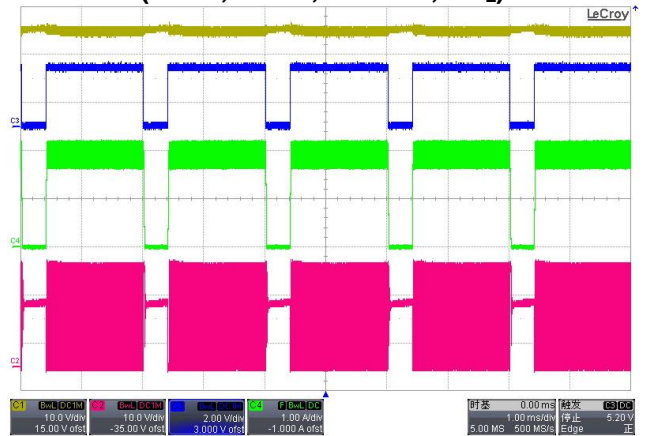
Start-up waveform(Vin=20V, 3LEDs)
(Y-Vin, R-SW, B-CTRL, G-I_L)



Soft Start waveform
(Vin=20V, 3LEDs, C4=10nF)
(Y-Vin, R-SW, B-CTRL, G-I_L)

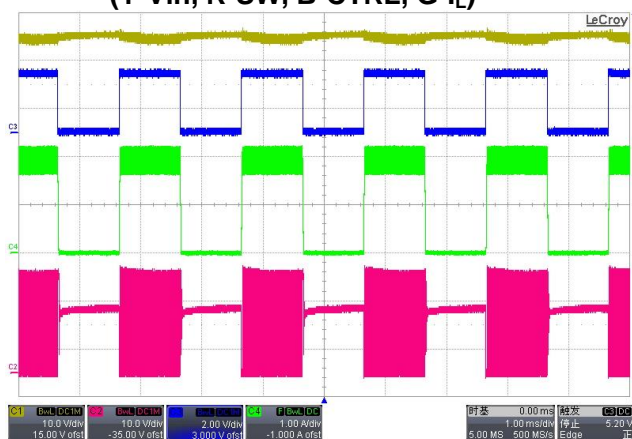


PWM Dimming waveform(Vin=20V, 3LEDs)
(PWM frequency=500Hz, Duty=80%)
(Y-Vin, R-SW, B-CTRL, G-I_L)

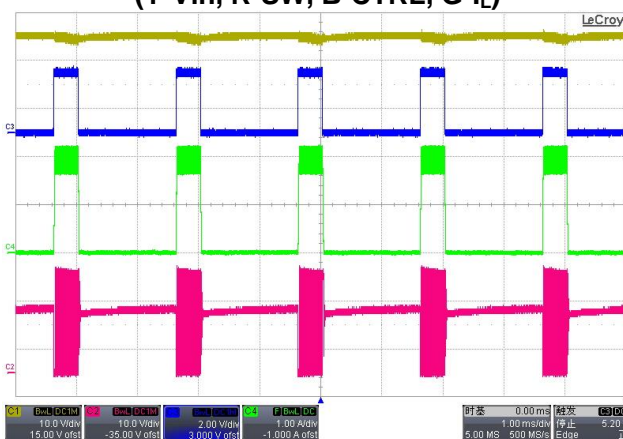


Functional Waveforms

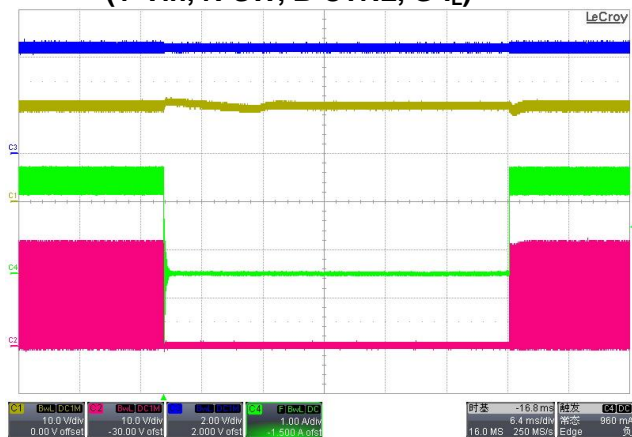
**PWM Dimming waveform(Vin=20V, 3LEDs)
(PWM frequency=500Hz, Duty=50%)
(Y-Vin, R-SW, B-CTRL, G-I_L)**



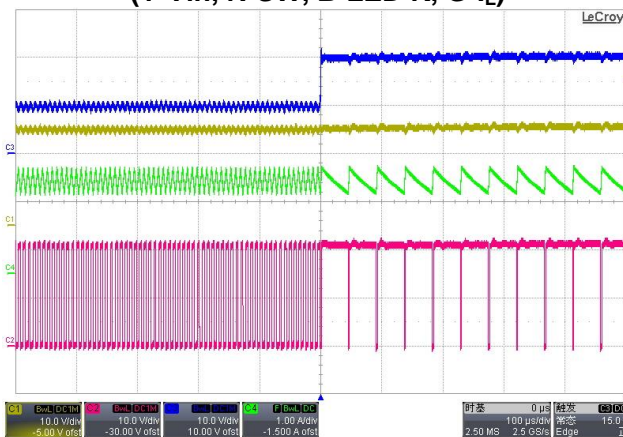
**PWM Dimming waveform(Vin=20V, 3LEDs)
(PWM frequency=500Hz, Duty=20%)
(Y-Vin, R-SW, B-CTRL, G-I_L)**



**LED open protection(Vin=20V, 3LEDs)
(Y-Vin, R-SW, B-CTRL, G-I_L)**

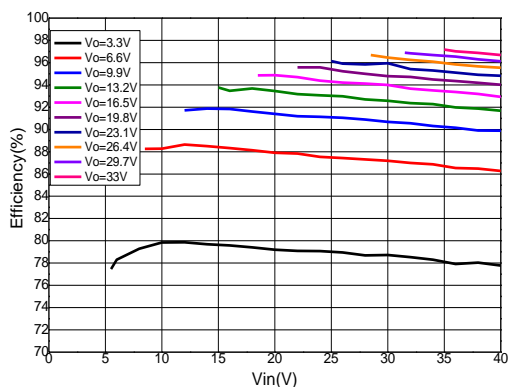


**LED short protection(Vin=20V, 3LEDs)
(Y-Vin, R-SW, B-LED K, G-I_L)**

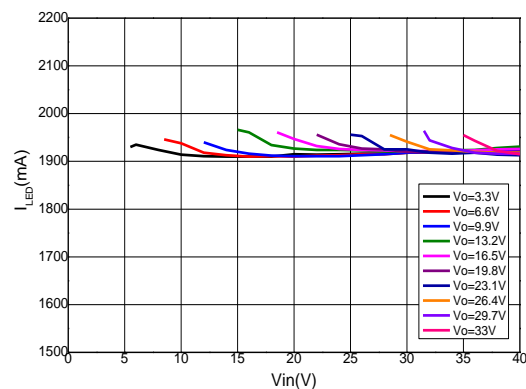


Functional Data Curves

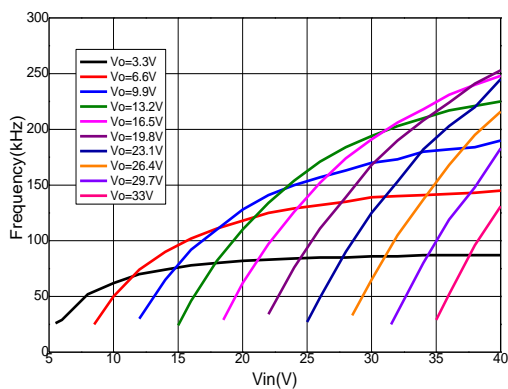
Efficiency vs. Input Voltage



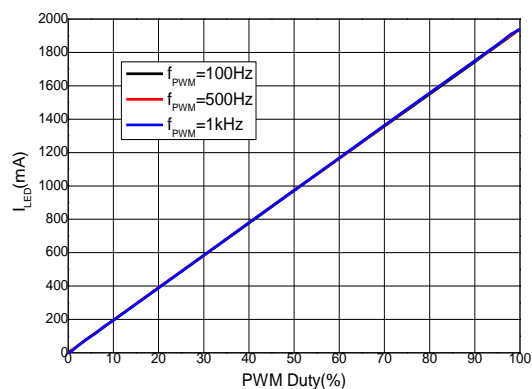
LED Current vs. Input Voltage



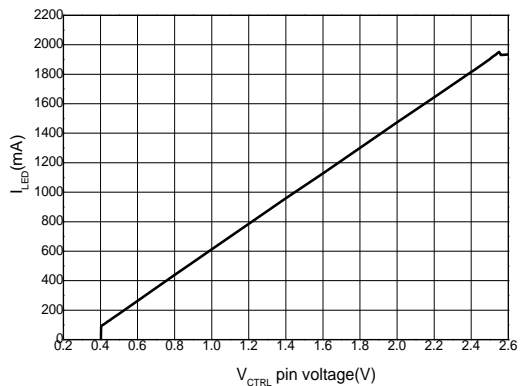
Operating Frequency vs. Input Voltage



PWM Dimming ($V_{in}=20V$, 3LEDs)



Analog Dimming ($V_{in}=20V$, 3LEDs)



Thermal Test

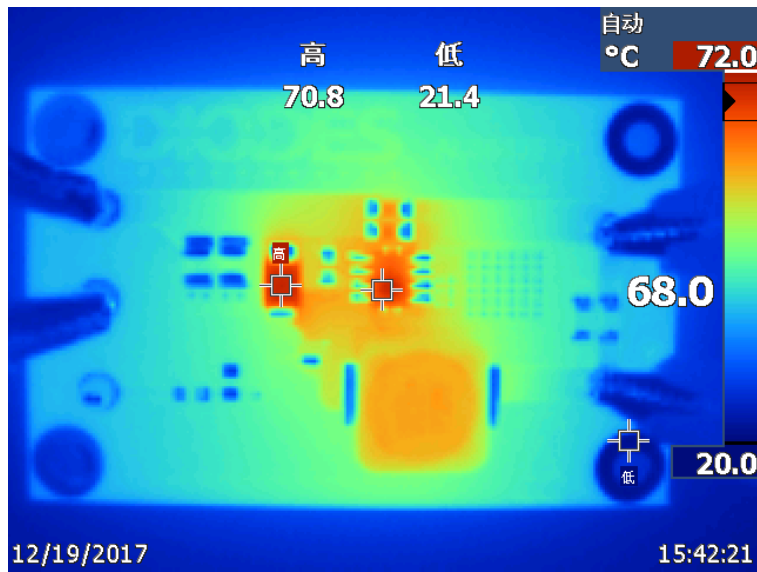


Figure 6: Top (Vin=20V, 3LEDs, Burn-in time=60min)

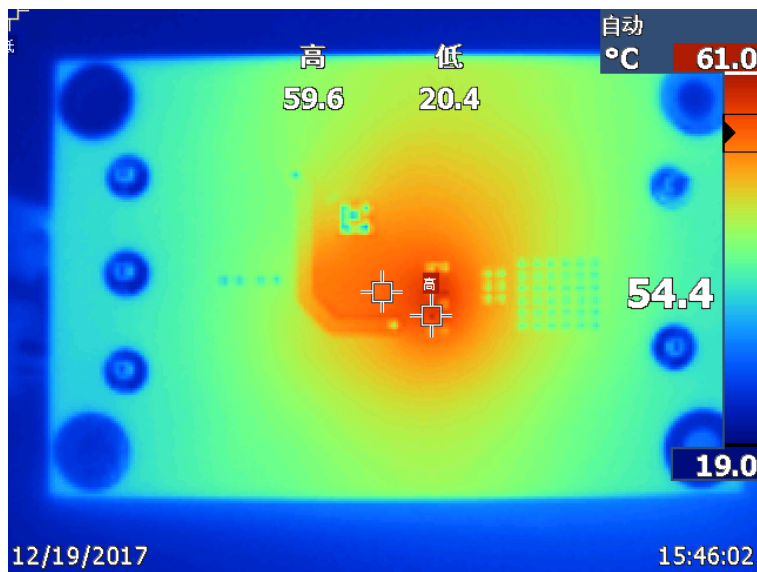


Figure 7: Bottom (Vin=20V, 3LEDs, Burn-in time=60min)

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