# AN-1406 LM3519 Evaluation Board

1   General Description

The LM3519 evaluation board is a working demonstration of a step up DC-DC converter. The LM3519 drives up to four white LEDs with a constant current to provide LCD backlighting in handheld devices. The LED current is internally set to 20 mA eliminating the use of external resistor. The series connection allows the LED current to be identical for uniform brightness and minimizes the number of traces to the LEDs. Brightness control is achieved by applying a PWM signal on the En pin with frequencies up to 30 kHz. A proprietary PFM architecture implementation results in non pulse skipping variable frequency operation over input voltage range permitting the use of low-cost, small external components. For further information and electrical characteristics, see the *LM3519 High Frequency Boost White LED Driver with High-Speed PWM Brightness Control Data Sheet* (SNVS394).
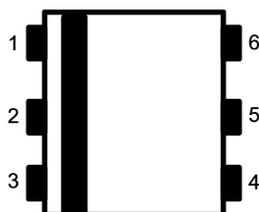
2   Operating Conditions

- Junction temperature (T_J) range: -40°C to +125°C
- Ambient temperature (T_A) range: -40°C to +85°C
- Input Voltage Range: 2.7 V to 5.5 V
- I_{OUT} = 20 mA
  Package
- SOT 23 - 6 pin

3   Typical Application
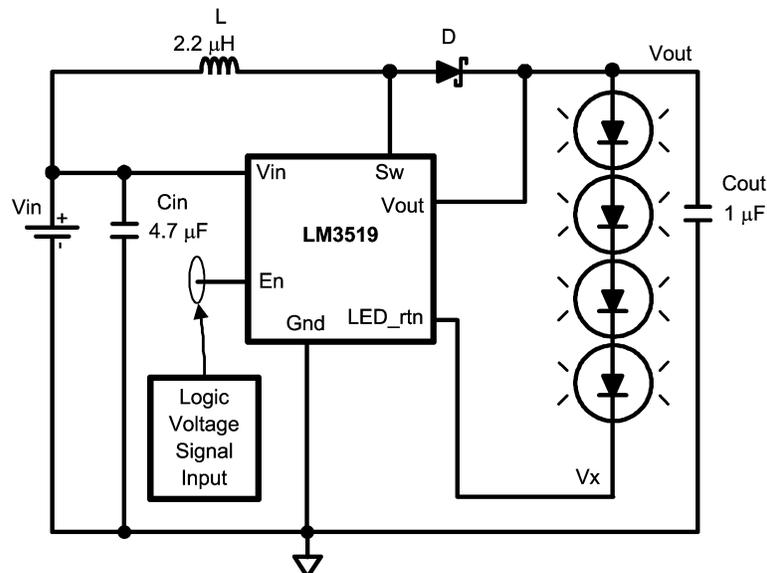
Figure 1. Typical Application Circuit

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4   Connection Diagram and Package Information

Figure 2. SOT23-6, Top View

Table 1. Pin Descriptions (SOT23-6)

Pin No	Name	Description
1	En	Device Enable Connection
2	Gnd	Ground Connection
3	V_{OUT}	Output Voltage Connection
4	LED_rtn	White LED Current Sensing Input Connection
5	Sw	Drain Connection of the Internal Power Field Effect Transistor (FET) Switch
6	V_{IN}	Input or Supply Voltage Connection

5   PWM Dimming

If a pulse width modulation (PWM) signal is used to adjust the brightness, a control signal frequency between 17 kHz to 30 kHz is recommended. Although the LM3519 is capable of operating outside this frequency range, it is not recommended to operate below 17 kHz for the following reasons:

- Frequency below 100Hz is likely to cause visible flicker in the light emitted by the LED string
- Frequency below 17 kHz may induce audible noise due to combinations of some capacitance and PCB

A PWM frequency above 30 kHz is possible but the current linearity vs duty cycle will be affected.

If it is not possible to operate the dimming control above 17 kHz, audible noise emission can be minimized by using capacitors with low susceptibility to piezoelectric induced stresses, such as poly film designs. Minimum audible noise is most likely to occur when the PWM frequency is less than 2 kHz. It is recommended that any application using a PWM control signal below 17 kHz be thoroughly evaluated for undesirable audible noise.

6   Layout Guidelines

The input capacitor, C_{IN}, must be placed close to the LM3519. Placing C_{IN} close to the device will reduce the metal trace resistance effect on input voltage ripple. Metal trace connections for the C_{OUT} capacitor can increase the effective series resistance, which affects output voltage ripple and efficiency. Trace connections to the inductor should be short and wide to reduce power dissipation, increase overall efficiency and reduce EMI radiation. The diode, like the inductor, should have trace connections that are short and wide to reduce power dissipation and increase overall efficiency. For more details regarding layout guidelines for switching regulators, see *AN-1149 Layout Guidelines for Switching Power Supplies* (SNVA021).
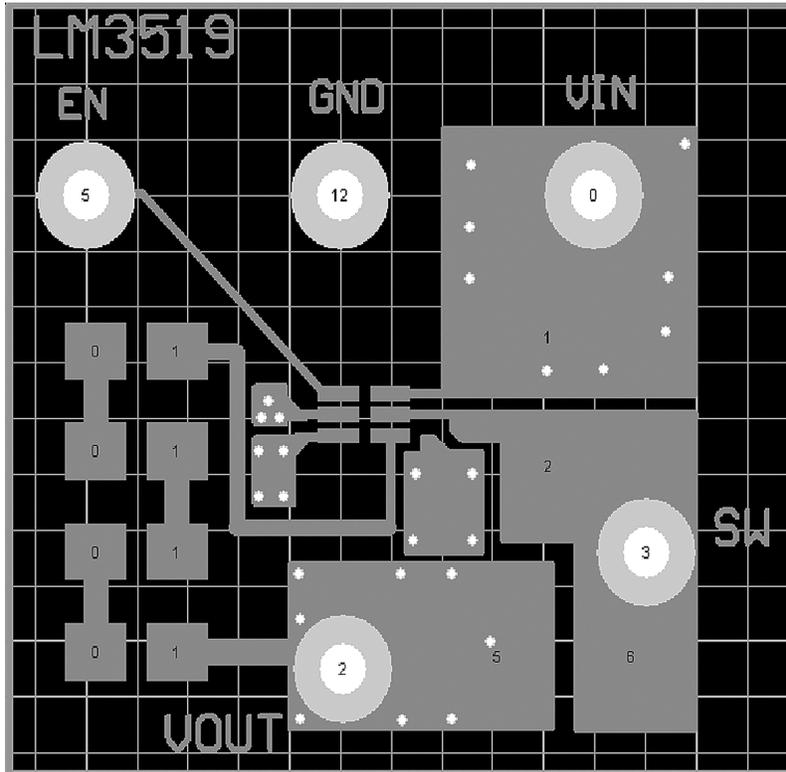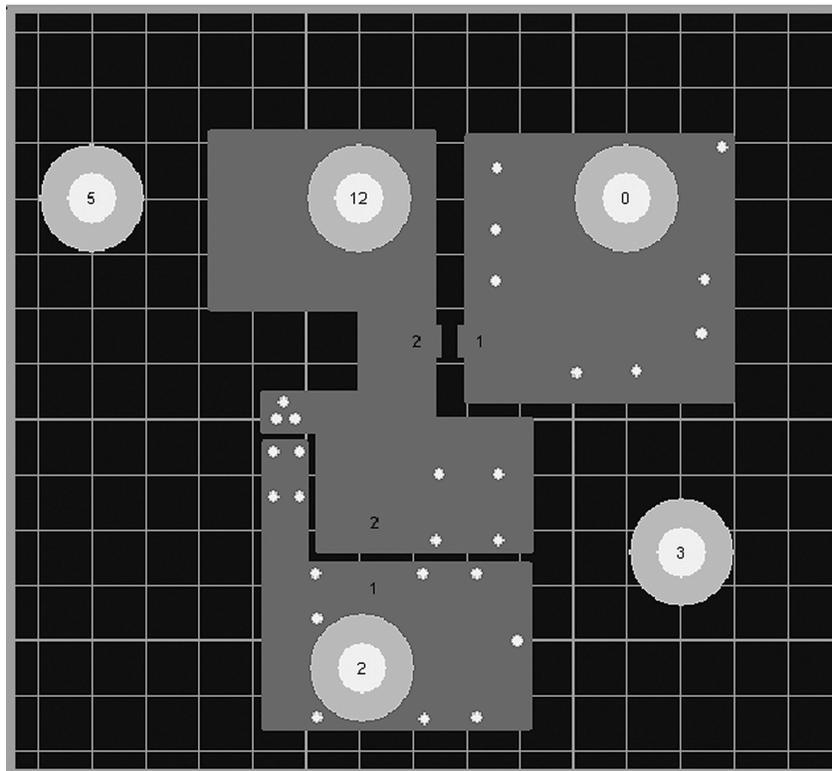
7   Evaluation Board Layout

Figure 3. Top Layer

Figure 4. Bottom Layer

Table 2. Bill of Materials (BOM) For Common Configurations

Component Name	Value	Specification	Manufacturer
U1	LM3519	SOT23-6	Texas Instruments
Cin	4.7 uF, 6.3 V, 0603	AVX06033D475MAT	AVX
Cout	1 µF, 25 V, 0603	AVX06033D105MAT	AVX
D1	Schottky Diode	CMMSH1-40	Central Semiconductor
L1	2.2 µH	LPO3310-222ML	CoilCraft
LED1-4	LWT67C	Hyper Topled	Osram Opto Semiconductors
Test Pin	**Description**	**Size**	**Quantity**
V_{IN}	Turret	0.09in	1
GND	Turret	0.09in	1
EN	Turret	0.09in	1
SW	Turret	0.09in	1
V_{OUT}	Turret	0.09in	1

IMPORTANT NOTICE

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