



EV3309-QG-00A

40mA, Synchronous Boost White LED Driver with I²C Interface Evaluation Board

DESCRIPTION

The EV3309-QG-00A is designed for the MP3309, a WLED driver. The device has a 2.7V to 5.5V input voltage range and uses peak current mode control to regulate the LED current sensed through an external, low-side resistor. Synchronous rectification and the 200mV feedback voltage reduce power loss and PCB size. To save driver losses, select non-synchronous mode by using an internal register to disable the rectifier MOSFET.

The MP3309 features a configurable switching frequency to optimize efficiency. It supports both analog and PWM dimming.

In addition, the MP3309 has LED open protection, cycle-by-cycle current limit protection, under-voltage protection (UVP), and thermal shutdown protection. The I²C interface can set the protection indication bits and the over-voltage protection (OVP) threshold.

The MP3309 is available in a QFN-10 (1.4mmx1.8mm) package

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V _{IN}	2.7 to 5.5	V
Output voltage	V _{LED}	<35	V
LED current	I _{LED}	40	mA

FEATURES

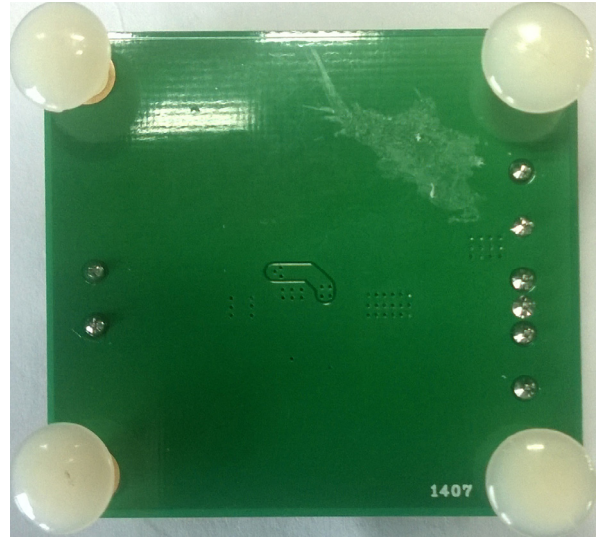
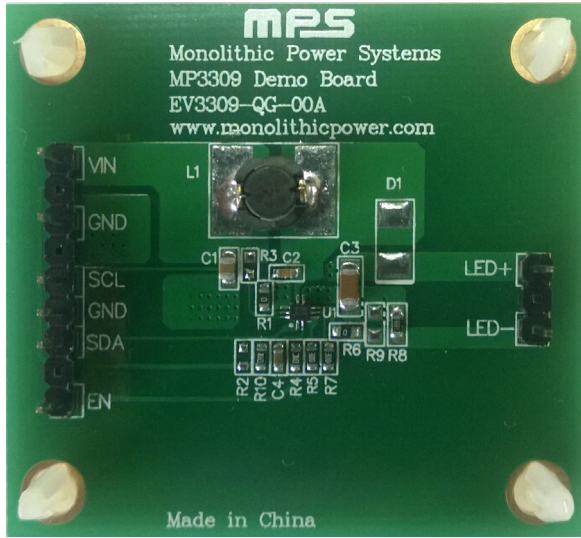
- 2.7V to 5.5V Input Voltage Range
- Analog and PWM Dimming
- Selectable Synchronous or Non-Synchronous Mode
- 400kHz I²C-Compatible Interface
- Digitally Set LED Current
- Configurable Switching Frequency
- Configurable Over-Voltage Protection (OVP) Threshold
- Low 200mV Feedback Voltage with ±1% Accuracy
- Software or Hardware Enable Function
- Internal Soft Start
- Under-Voltage Lockout (UVLO), Thermal Shutdown, and Over-Current Protection (OCP)
- The MP3309 Supports Default Analog Dimming (PWMH) via the External PWM Signal Input
- The MP3309C Provides a Default I²C Interface
- Available in a QFN-10 (1.4mmx1.8mm) Package

APPLICATIONS

- Feature Phones and Smartphones
- Tablets
- <10inch Video Displays

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EV3309-QG-00A EVALUATION BOARD



LxWxH (5cmx4.6cmx1.0cm)

Board Number	MPS IC Number
EV3309-QG-00A	MP3309GQG

QUICK START GUIDE

1. Place a voltage source (2.7 to 5.5V) between the VIN terminal and GND.
2. Connect the LED strings between LED+ and LED-.
3. Set the dimming mode.

Analog Dimming

1. Pull the EN/PWML pin to logic high. To select analog dimming for different ICs, follow the instructions below:
 - a. MP3309: the default analog dimming is set by an external PWM input. For analog dimming, connect the SCL and SDA pins together to act as PWMH, then add a >20kHz PWM signal to PWMH.
 - b. MP3309C: the MP3309C can work with the I²C interface. Control the dimming via register 00h, bits[D0:D4]. Set the EN bit to 1 before dimming.

PWM Dimming

1. Connect the SCL and SDA pins together, then pull these pins to logic high.
2. Apply a 200Hz to 2kHz PWM signal to the EN/PWML pin.
3. To select the output current using a resistor on the FB pin, see the related IC datasheet for more details.

EVALUATION BOARD SCHEMATIC

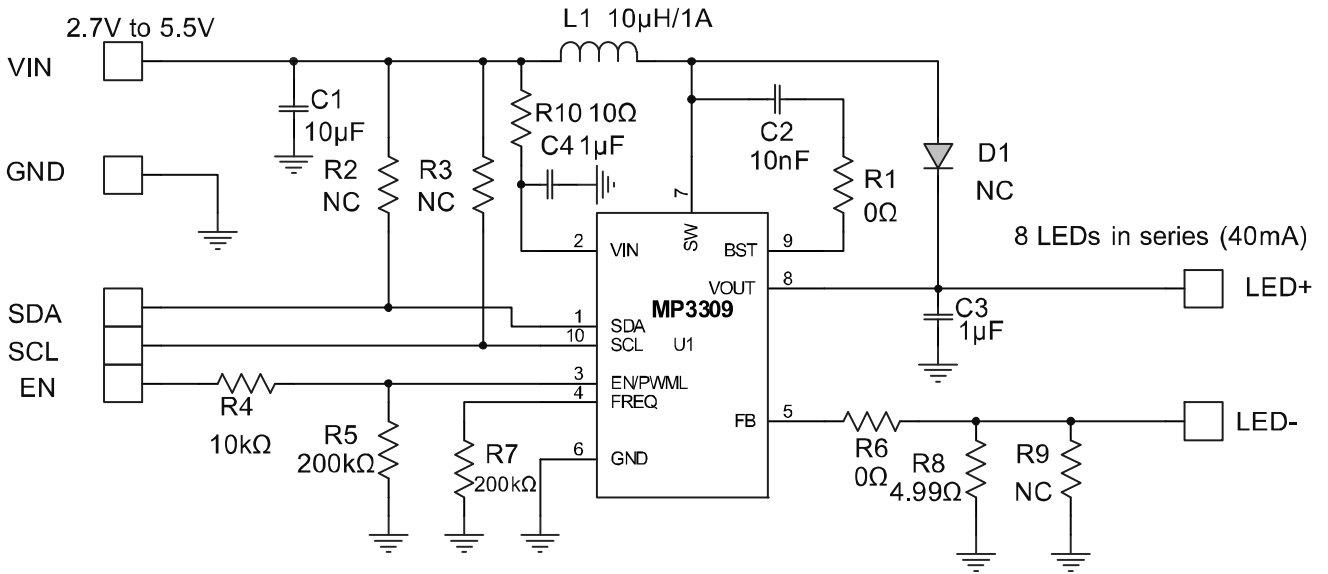


Figure 1: Evaluation Board Schematic

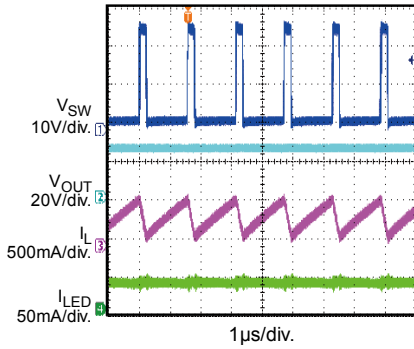
EV3309-RT-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	C1	10 μ F	Ceramic capacitor, 6.3V, X7R	0805	Murata	GCM21BR70J106KE2
1	C2	10nF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H103KA01D
1	C3	1 μ F	Ceramic capacitor, 50V, X7R	1206	Murata	GRM31MR71H105KA88L
1	C4	1 μ F	Ceramic capacitor, 6.3V, X5R	0603	Murata	GRM188R60T105KA01D
1	D1	NC				
1	L1	10 μ H	Inductor, 1.14A, DCR = 59m Ω	SMD	Toko	D63LCB-A921CY-100M=P3
2	R1, R6	0 Ω	Resistor, 0 Ω , 5%	0603	Yageo	RC0603JR-070RL
1	R10	10 Ω	Resistor, 10 Ω , 1%	0603	Yageo	RC0603FR-0710RL
3	R2, R3, R9	NC				
2	R5, R7	200k Ω	Resistor, 200k Ω , 1%	0603	Yageo	RC0603FR-07200KL
1	R4	10k Ω	Resistor, 10k Ω , 1%	0603	Yageo	RC0603FR-0710KL
1	R8	4.99 Ω	Resistor, 4.99 Ω , 1%	0603	Yageo	RC0603FR-074R99L
1	U1	MP3309	White LED driver	QFN-10 (1.4mmx1.8mm)	MPS	MP3309GQG

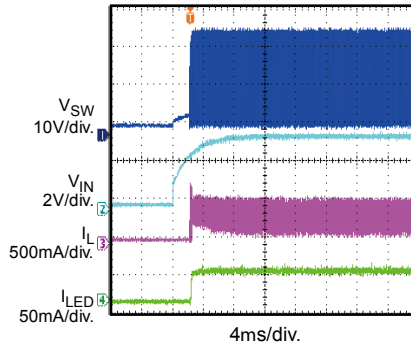
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. $V_{IN} = 3.6V$, 8 LEDs in series, $I_{LED} = 40mA$, $L = 10\mu H$, $T_A = 25^\circ C$, unless otherwise noted.

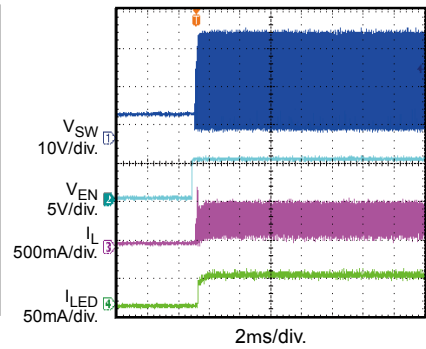
Steady State



Start-Up through VIN

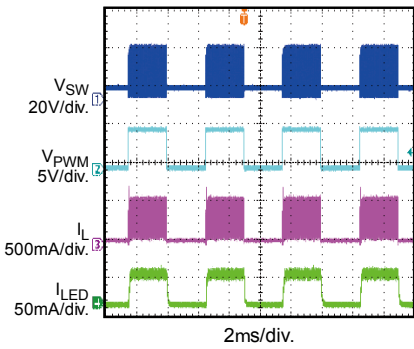


Start-Up through EN



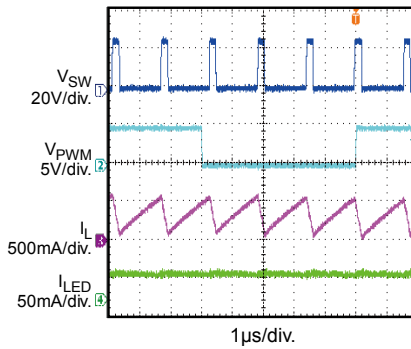
PWM Dimming

$f_{DIM} = 200Hz$, $D_{DIM} = 50\%$

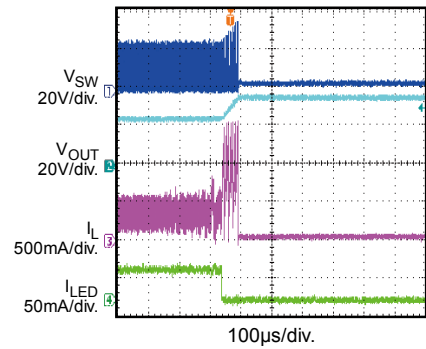


Analog Dimming

$f_{DIM} = 20kHz$, $D_{DIM} = 90\%$

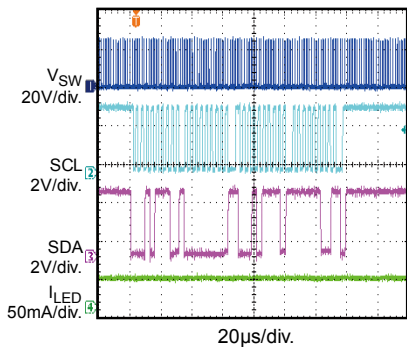


Open LED Protection



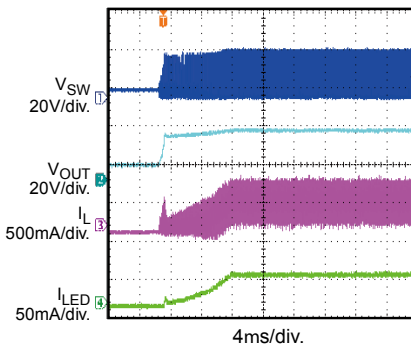
Set I_{LED} via the I²C

For the MP3309C



Set Enable Bit to 1

For the MP3309C



PCB LAYOUT

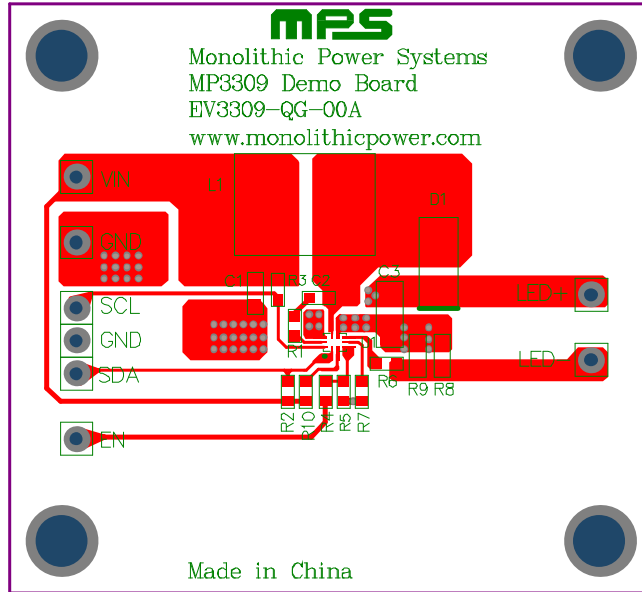


Figure 2: Top Layer

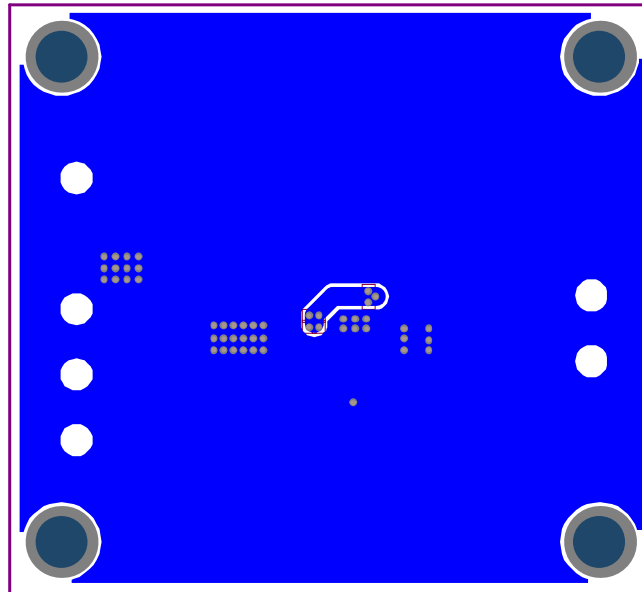


Figure 3: Bottom Layer



Revision History

Revision #	Revision Date	Description	Pages Updated
1.0	06/19/2014	Initial Release	-
1.1	03/13/2015	EVB waveforms added	P6
1.2	02/24/2021	Grammar review	All

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