# EVQ3367-R-01A

**6-Channel, Maximum 150mA/Ch Boost WLED Driver with 15000:1 Dimming Ratio and I²C Evaluation Board**

## DESCRIPTION

The EVQ3367-R-01A is an evaluation board designed for the MPQ3367, a step-up converter with six channel current sources. It is designed to drive the white LED arrays as backlighting for small- or medium-sized LCD panels.

The device uses peak current mode as its PWM control architecture to regulate the boost converter. Six channel current sources are applied to the LED cathode to adjust the LED brightness. The MPQ3367 regulates the current in each LED string to the value set by an external current-setting resistor, with 2.5% current regulation accuracy between strings.

A low on resistance MOSFET and headroom voltage are provided to improve efficiency. The MPQ3367 has a standard I²C digital interface for easy use. The switching frequency can be configured via a resistor, I²C interface, or external clock.

The MPQ3367 provides analog, PWM, and mix dimming mode with a PWM input. The dimming mode can be selected with the I²C interface or the MIX/AD pin. The device also has a phase shift function to eliminate noise during PWM dimming.

Protection features that guarantee safe operation include over-current protection (OCP), over-voltage protection (OVP), over-temperature protection (OTP), LED short and open protection. The LED current also automatically decreases at high temperatures.

The MPQ3367 is available in QFN-24 (4mmx4mm) and TSSOP-28EP packages.

## ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Input voltage | $V_{IN}$ | 12 | V |
| Output voltage | $V_{LED}$ | <50 | V |
| LED number | - | 6 strings | - |
| LED current/ string | $I_{LED}$ | 50 | mA |

## FEATURES

- 3.5V to 36V Input Voltage Range
- 6 Channels with Maximum 150mA per Channel
- Internal 100mΩ, 50V MOSFET
- Configurable Switching Frequency Up to 2.2MHz
- External Sync SW Function
- Multi-Dimming Operation Mode through the PWM Input, including:
  - Direct PWM Dimming
  - Analog Dimming
  - Mixed Dimming with 25% or 12.5% Transfer Point
- 15000:1 Dimming Ratio in PWM Dimming when $f_{PWM}$ ≤ 200Hz
- 200:1 Dimming Ratio during Analog Dimming through the PWM Dimming Signal Input
- Excellent EMI Performance
- Frequency Spread Spectrum
- I²C Interface
- Phase Shift Function for PWM Dimming
- 2.5% Current Matching
- Cycle-by-Cycle Current Limiting
- Disconnect VOUT from VIN
- LED Current Auto-Decrement at High Temperatures
- LED Short/Open, OTP, OCP, and Inductor Short Protections
- Configurable LED Short and OVP Thresholds
- Fault Indicator Signal Output
- Available in QFN-24 (4mmx4mm) and TSSOP-28EP Packages

## APPLICATIONS

- Tablets/Notebooks
- Automotive Displays

## EVQ3367-R-01A EVALUATION BOARD
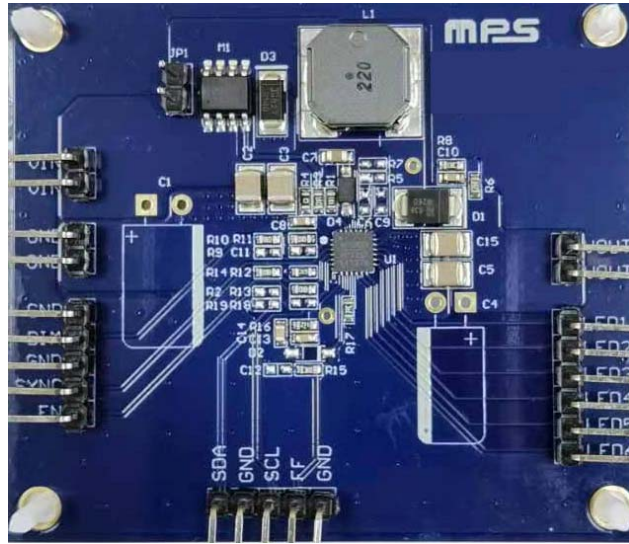


**Top**



**Bottom**
**LxW (6.35cmx5.25cm)**

| Board Number | MPS IC Number |
|---|---|
| EVQ3367-R-01A | MPQ3367GRE |

# QUICK START GUIDE

1. Provide a voltage source (3.5V to 36V) between the VIN terminal and GND on the evaluation board.

2. Connect the LED load (6 strings) terminals to:

    a. Positive (+): LED+

    b. Negative (-): LED1–6 pins

3. Drive the EN pin high to turn the MPQ3367 on; drive the EN pin low to turn the device off.

4. Apply a 100Hz to 20kHz PWM pulse to the PWM terminal.

If using the I²C to set the IC functions, follow the steps below:

1. Connect the SCL, SDA, and GND pins of the evaluation board to their respective pin locations on the I²C kit.

2. Write to and read the registers using the steps below:

    a. Ensure that the I²C kit can communicate with the computer. If the message "USB is not connected" appears on the GUI, then the I²C kit cannot communicate with the computer (see Figure 1). Otherwise, the GUI and I²C kit are able to communicate.
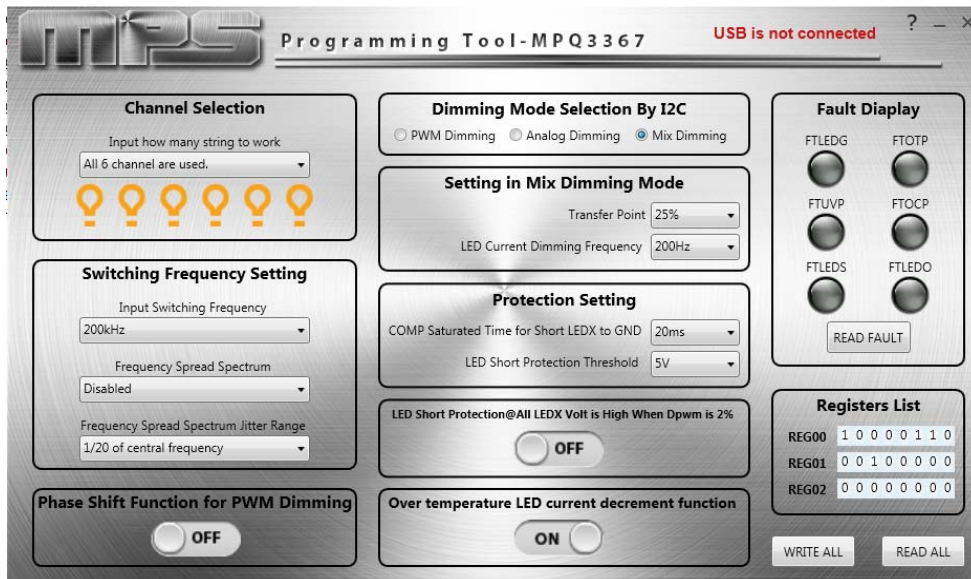


**Figure 1: MPQ3367 GUI Interface**

    b. Use the interface to adjust the parameters.

    c. After setting the parameters, click "WRITE ALL" to send the data to the IC.

    d. To check that the data has been written to the IC, click the "READ ALL" button.
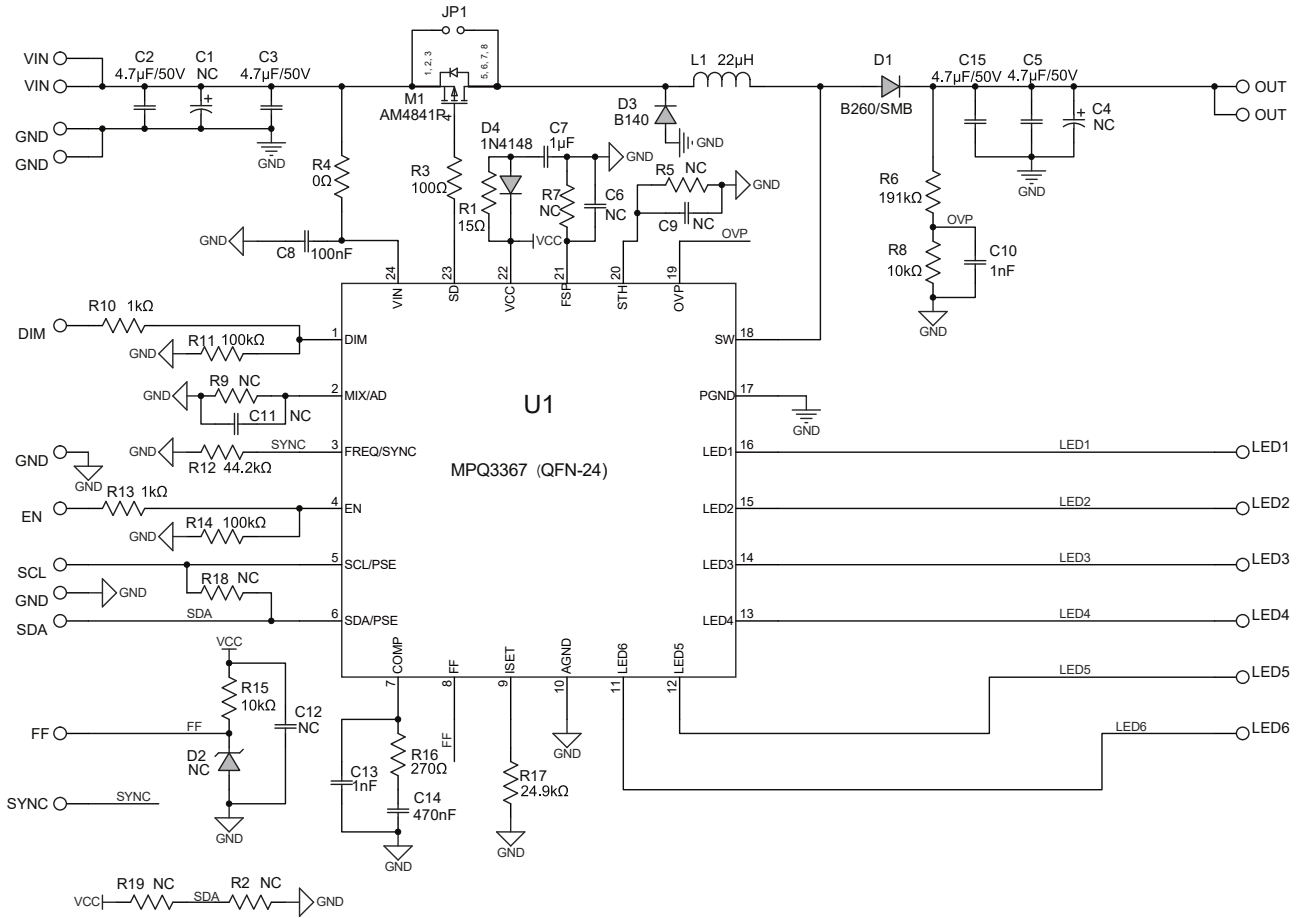
# EVALUATION BOARD SCHEMATIC



**Figure 2: Evalutation Board Schematic**

## EVQ3367-R-01A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer P/N |
|---|---|---|---|---|---|---|
| 1 | C1 | NC | Electrolytic capacitor, 100µF/50V | DIP | | |
| 4 | C2, C3 C5, C15 | 4.7µF/50V | Ceramic capacitor, 50V, X7R | 1210 | Murata | GRM32ER71H475KA88L |
| 1 | C4 | NC | Electrolytic capacitor, 22µF/50V | DIP | | |
| 1 | C7 | 1µF/25V | Ceramic capacitor, 25V, X7R | 0805 | Murata | GRM216R61E105KA12D |
| 1 | C8 | 100nF/50V | Ceramic capacitor, 50V, X7R | 0603 | TDK | C1608X7R1H104K |
| 4 | C6, C9, C11, C12 | NC | | 0603 | | |
| 2 | C10, C13 | 1nF/10V | Ceramic capacitor, 16V, X7R | 0603 | Murata | GRM188R71102KA01D |
| 1 | C14 | 470nF/10V | Ceramic capacitor, 16V, X7R | 0603 | TDK | C1608X7R1C474K |
| 1 | D1 | B260 | Schottky diode, 60V, 2A | SMB | Diodes Inc. | B260 |
| 1 | D2 | NC | Zener diode, 3.3V | SOD-123 | | |
| 1 | D3 | B140 | Schottky diode, 40V, 1A | SMA | Diodes Inc. | B140 |
| 1 | D4 | 1N4148W | Diode, 75V, 0.15A | SOD-123 | Diodes Inc. | 1N4148W |
| 1 | JP1 | NC | Connector, 2.54mm 180° | CONN/DIP | | |
| 1 | L1 | 22µH | Inductor, 22µH, 68.1mΩ, $I_{SAT}$ = 4.2A | SMD | Murata | 1274AS-H-220M=P3 |
| 1 | M1 | AM4841P | P-channel MOSFET, -40V/9A | MOS/SO8 | Analog Power | AM4841P |
| 1 | R1 | 15Ω | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-0715RL |
| 6 | R2, R5, R7, R9, R18, R19 | NC | Film resistor, 1% | RES/0603 | | |
| 1 | R3 | 100Ω | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-07100RL |
| 1 | R4 | 0Ω | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-070RL |
| 1 | R6 | 191kΩ | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-07191KL |
| 2 | R8, R15 | 10kΩ | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-0710KL |
| 2 | R10, R13 | 1kΩ | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-071KL |
| 2 | R11, R14 | 100kΩ | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-07100KL |
| 1 | R12 | 44.2kΩ | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-0744K2L |
| 1 | R16 | 270Ω | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-07270RL |
| 1 | R17 | 24.9kΩ | Film resistor, 1% | RES/0603 | Yageo | RC0603FR-0724K9L |
| 1 | U1 | MPQ3367 | 6-channel LED driver | QFN-24 (4mmx4mm) | MPS | MPQ3367GR |

# PCB LAYOUT
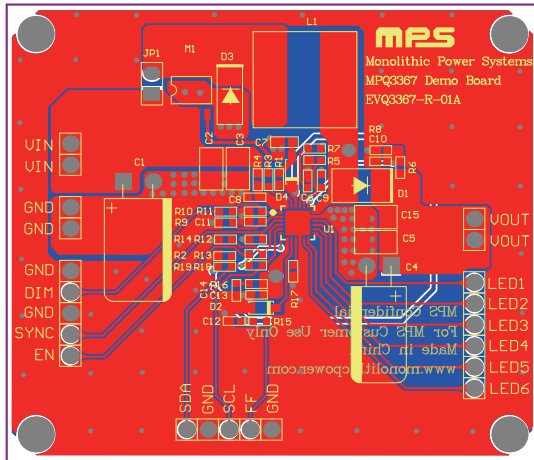


Figure 3: Top Layer
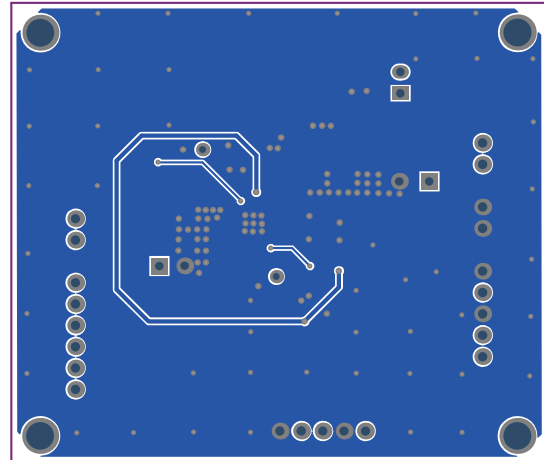


Figure 4: Bottom Layer

## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 1/22/2021 | Initial Release | - |

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