# EVQ3367A-R-00A

## 6-Channel, Maximum 150mA/Ch Boost WLED Driver with 15000:1 Dimming Ratio and I²C Evaluation Board, AEC-Q100 Qualified

## DESCRIPTION

The EVQ3367A-R-00A is an evaluation board designed to demonstrate the capabilities of the MPQ3367A, a step-up converter with six channel current sources. It is designed to drive white LED arrays as backlighting for small- and medium-sized LCD panels.

The device uses peak current mode as its pulse-width modulation (PWM) control architecture to regulate the boost converter. Six channel current sources are applied to the LED cathode to adjust the LED brightness. The MPQ3367A 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 low headroom voltage improve efficiency. For ease of use, the MPQ3367A features a standard I²C digital interface. The switching frequency ($f_{SW}$) can be configured via a resistor, the I²C interface, or an external clock.

The MPQ3367A features analog, PWM, and mixed dimming modes 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 include over-current protection (OCP), over-voltage protection (OVP), over-temperature protection (OTP), and LED short and open protection. The LED current also decreases automatically at high temperatures.

The MPQ3367A is available in a QFN-24 (4mmx4mm) package.

## ELECTRICAL SPECIFICATIONS

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

## FEATURES

- 3.5V to 36V Operating Input Voltage
- 6 Channels with Maximum 150mA per Channel
- Internal 100mΩ, 50V MOSFET
- Up to 2.2MHz Configurable Switching Frequency ($f_{SW}$)
- External Sync SW Function
- Multi-Dimming Operation Mode through Pulse-Width Modulation (PWM) Input:
  - Direct PWM Dimming
  - Analog Dimming
  - Mix Dimming with 25% or 12.5% Transfer Point
- 15000:1 Dimming Ratio during PWM Dimming when $f_{PWM} \leq 200Hz$
- 200:1 Dimming Ratio during Analog Dimming through PWM Dimming Signal Input
- Excellent EMI Performance
- Frequency Spread Spectrum
- I²C Interface, 3 Selectable IC Addresses
- Phase Shift Function for PWM Dimming
- 2.5% Current Matching
- Cycle-by-Cycle Current Limiting
- Disconnect $V_{OUT}$ from $V_{IN}$
- LED Current Auto-Decrement at High Temperatures
- LED Short/Open Protection, Over-Current Protection (OCP), Over-Temperature Protection (OTP), Inductor Short Protection
- Programmable LED Short and Over-Voltage Protection (OVP) Thresholds
- Fault Indicator Signal Output
- Available in a QFN-24 (4mmx4mm) Package
- Available in Grade AEC-Q100 Grade 1

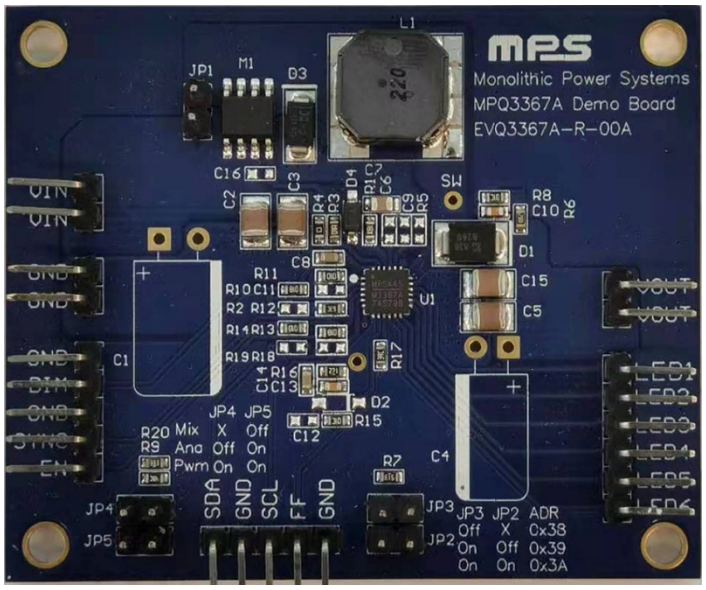
## APPLICATIONS

- Tablets/Notebooks
- Automotive Displays

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# EVQ3367A-R-00A EVALUATION BOARD




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

| Board Number | MPS IC Number |
|---|---|
| EVQ3367A-R-00A | MPQ3367AGRE |


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## 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 EN high to turn the converter on; drive EN low to turn it off.
4. Add a 100Hz to 20kHz PWM pulse to the PWM terminal.

If using the I²C to configure the IC, 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 (EVKT-USBI2C-02).
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. (1)

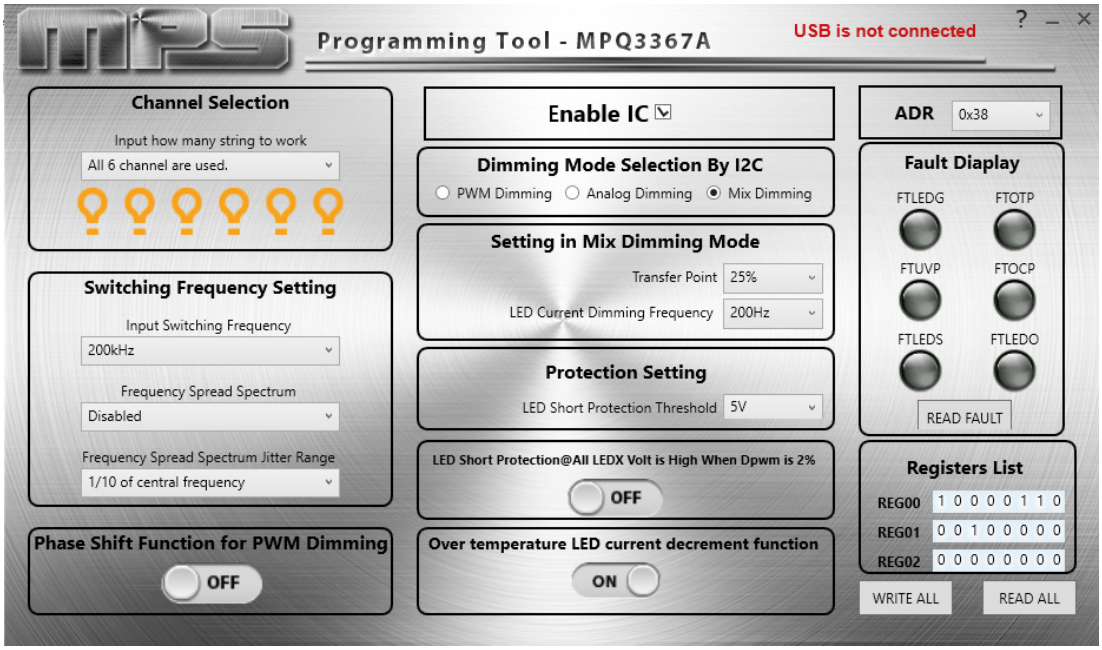



**Figure 1: MPQ3367A GUI**

   b. Use the GUI to adjust the parameters.
   c. After setting the parameters, click the “WRITE ALL” button to send the data to the IC.
   d. To check that the data has been written to the IC, click the “READ ALL” button.

**Note:**

1) The GUI can be downloaded from the MPS website.


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# EVALUATION BOARD SCHEMATIC

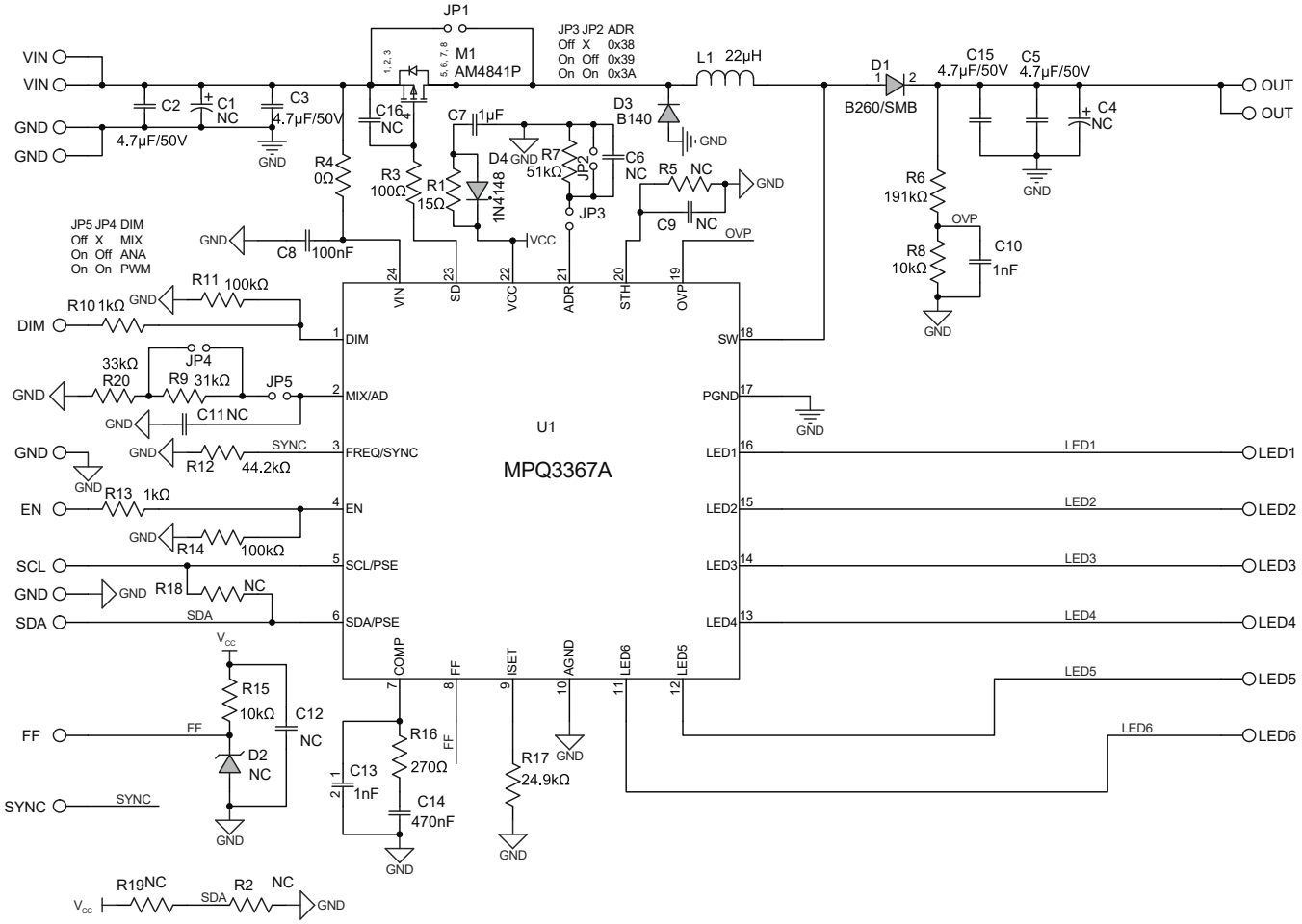



**Figure 2: Evaluation Board Schematic**


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# EVQ3367A-R-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|---|---|---|---|---|---|---|
| 1 | C1 | NC | Electrolytic capacitor, 100µF, 50V | DIP | | |
| 4 | C2, C3, C5, C15 | 4.7µF | Ceramic capacitor, 50V, X7R | 1210 | Murata | GCM32ER71H475KA55L |
| 1 | C4 | NC | Electrolytic capacitor, 22µF, 50V | DIP | | |
| 1 | C7 | 1µF | Ceramic capacitor, 25V, X7R | 0805 | Murata | GCM21BR71E105KA56L |
| 1 | C8 | 100nF | Ceramic capacitor, 50V, X7R | 0603 | TDK | GCM188R71H104KA57D |
| 5 | C6, C9, C11, C12, C16 | NC | | 0603 | | |
| 2 | C10, C13 | 1nF | Ceramic capacitor, 16V, X7R | 0603 | Wurth | 885012206034 |
| 1 | C14 | 470nF | Ceramic capacitor, 16V, X7R | 0603 | TDK | GCM188R71C474KA55D |
| 1 | D1 | 2A | Schottky diode, 60V | SMB | Diodes, Inc. | B260 |
| 1 | D2 | NC | Zener diode, 3.3V | SOD-123 | | |
| 1 | D3 | 1A | Schottky diode, 40V | SMA | Diodes, Inc. | B140 |
| 1 | D4 | 0.15A | Diode, 75V | SOD-123 | Changdian | 1N4148W |
| 5 | JP1, JP2, JP3, JP4, JP5 | 2.54mm | 2-pin connector | CONN/DIP | Any | |
| 1 | L1 | 22µH | Inductor, 68.1mΩ, $I_{SAT}$ = 4.2A | SMD | Murata | 1274AS-H-220M=P3 |
| 1 | M1 | -40V | P-channel MOSFET, 9A | MOS/SO8 | Analog Power | AM4841P |
| 1 | R1 | 15Ω | Film resistor, 1% | 0603 | Yageo | RC0603FR-0715RL |
| 4 | R2, R5, R18, R19 | NC | Film resistor, 1% | 0603 | | |
| 1 | R3 | 100Ω | Film resistor, 1% | 0603 | Yageo | RC0603FR-07100RL |
| 1 | R4 | 0Ω | Film resistor, 1% | 0603 | Yageo | RC0603FR-070RL |
| 1 | R6 | 191kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-07191KL |
| 1 | R7 | 51kΩ | Film resistor, 1% | 0603 | Synton-Tech | RC0603FR-0751KL |
| 2 | R8, R15 | 10kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0710KL |
| 1 | R9 | 30.9kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0730K9L |
| 2 | R10, R13 | 1kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-071KL |
| 2 | R11, R14 | 100kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-07100KL |
| 1 | R12 | 44.2kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0744K2L |
| 1 | R16 | 270Ω | Film resistor, 1% | 0603 | Yageo | RC0603FR-07270RL |
| 1 | R17 | 24.9kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0724K9L |
| 1 | R20 | 33kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0733KL |
| 1 | U1 | MPQ3367A | Six-channel LED driver | QFN-24 (4mmx4mm) | MPS | MPQ3367AGRE |


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## PCB LAYOUT

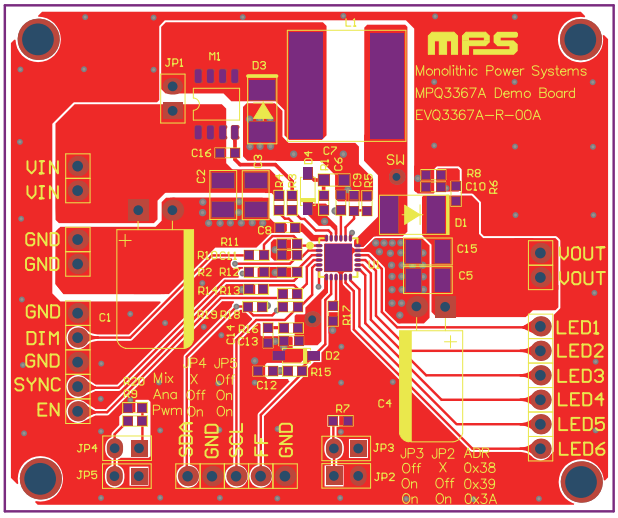



**Figure 3: Top Layer**

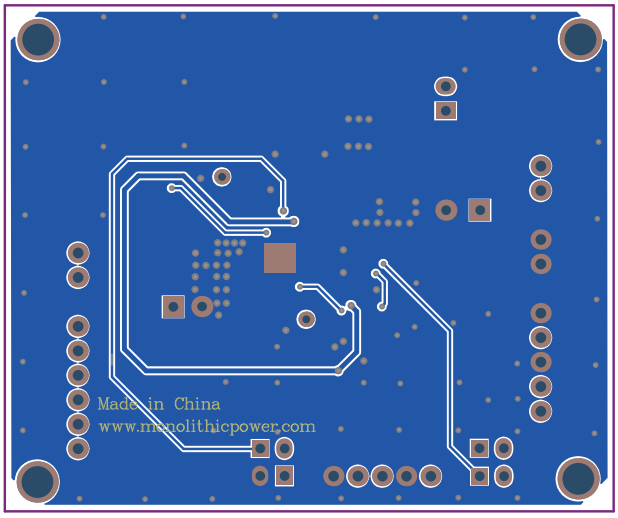



**Figure 4: Bottom Layer**


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## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 5/10/2021 | Initial Release | - |

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