



EVQ3369-R-01A

6-Channel, Max 100mA/Ch Boost WLED Driver with 15000:1 Dim Ratio and I²C Evaluation Board

DESCRIPTION

The EVQ3369-R-01A is an evaluation board for the MPQ3369, which is a step-up converter with six channel current sources. It is designed for driving the white LED arrays as backlighting for mid- or small-sized LCD panels.

The MPQ3369 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. It 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.

The IC employs a low on-resistance MOSFET and a low headroom voltage design to achieve high efficiency. It has a standard I²C digital interface for easy use. The switching frequency can be programmed by a resistor, the I²C interface, or an external clock.

The MPQ3369 provides analog, PWM, and mix dimming mode with PWM input. The dimming mode can be selected via the I²C interface or the MIX/AD pin. It also offers a phase shift function to eliminate noise when PWM dimming.

Protections features designed to 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 MPQ3369 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 |
| LEDs# | | 6 strings | |
| LED current /string | I _{LED} | 50 | mA |

FEATURES

- 3.5V to 36V Input Voltage Range
- 6 Channels with Max 100mA per Channel
- Internal 100mΩ, 50V MOSFET
- Programmable Up to 2.2MHz f_{SW}
- External Sync SW Function
- Multi-Dimming Operation Mode through PWM Input, including:
 - Direct PWM Dimming
 - Analog Dimming
 - Mix Dimming with 25%/12.5% Transfer Point
- 15000:1 Dim Ratio in PWM Dimming at f_{PWM} ≤ 200Hz
- 200:1 Dim Ratio at Analog Dim through 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 V_{OUT} from V_{IN}
- LED Current Auto-Decrement at High Temperatures
- LED Short/Open, OTP, OCP, and Inductor Short Protections
- Programmable LED Short and OVP Thresholds
- Fault Indicator Signal Output
- Available in QFN-24 (4mmx4mm) and TSSOP-28EP Packages

APPLICATIONS

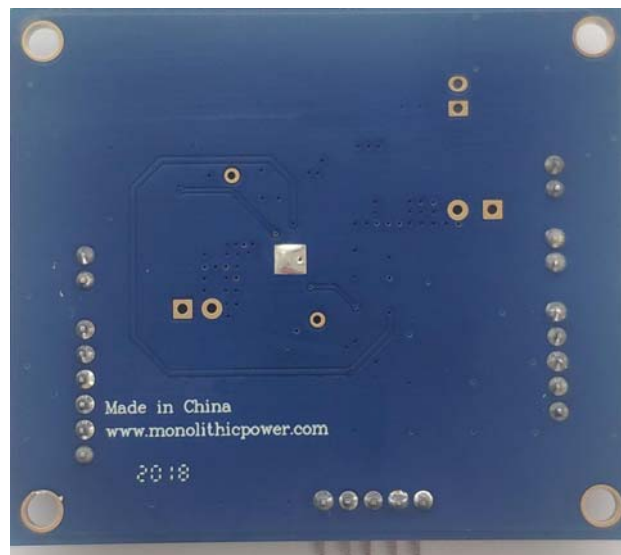
- Tablets/Notebooks
- Automotive Displays

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EVQ3369-R-01A EVALUATION BOARD



Top



Bottom

(LxW) 6.35cmx5.25cm

| Board Number | MPS IC Number |
|---------------|---------------|
| EVQ3369-R-01A | MPQ3369GR |

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 MPQ3369 on; drive the EN pin low to turn the device off.
4. Add a 100Hz to 20kHz PWM pulse to the PWM terminal.

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

5. Connect the SCL, SDA, and GND pins of the evaluation board to the SCL, SDA, and GND pins of the I²C kit (EVKT-USBI2C-02), respectively.
6. Write and read the registers:
 - a. Check that the I²C kit is communicating 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, communication should be functioning properly.
 - b. Click the button(s) to select the parameter(s) that are to be changed.
 - c. After setting the desired 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.

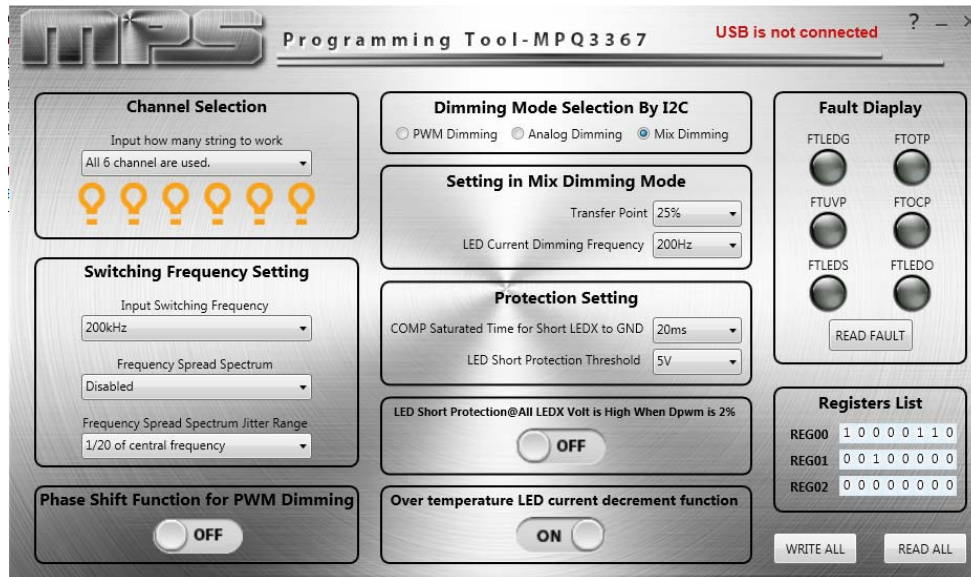


Figure 1: MPQ3369 GUI Interface

EVALUATION BOARD SCHEMATIC

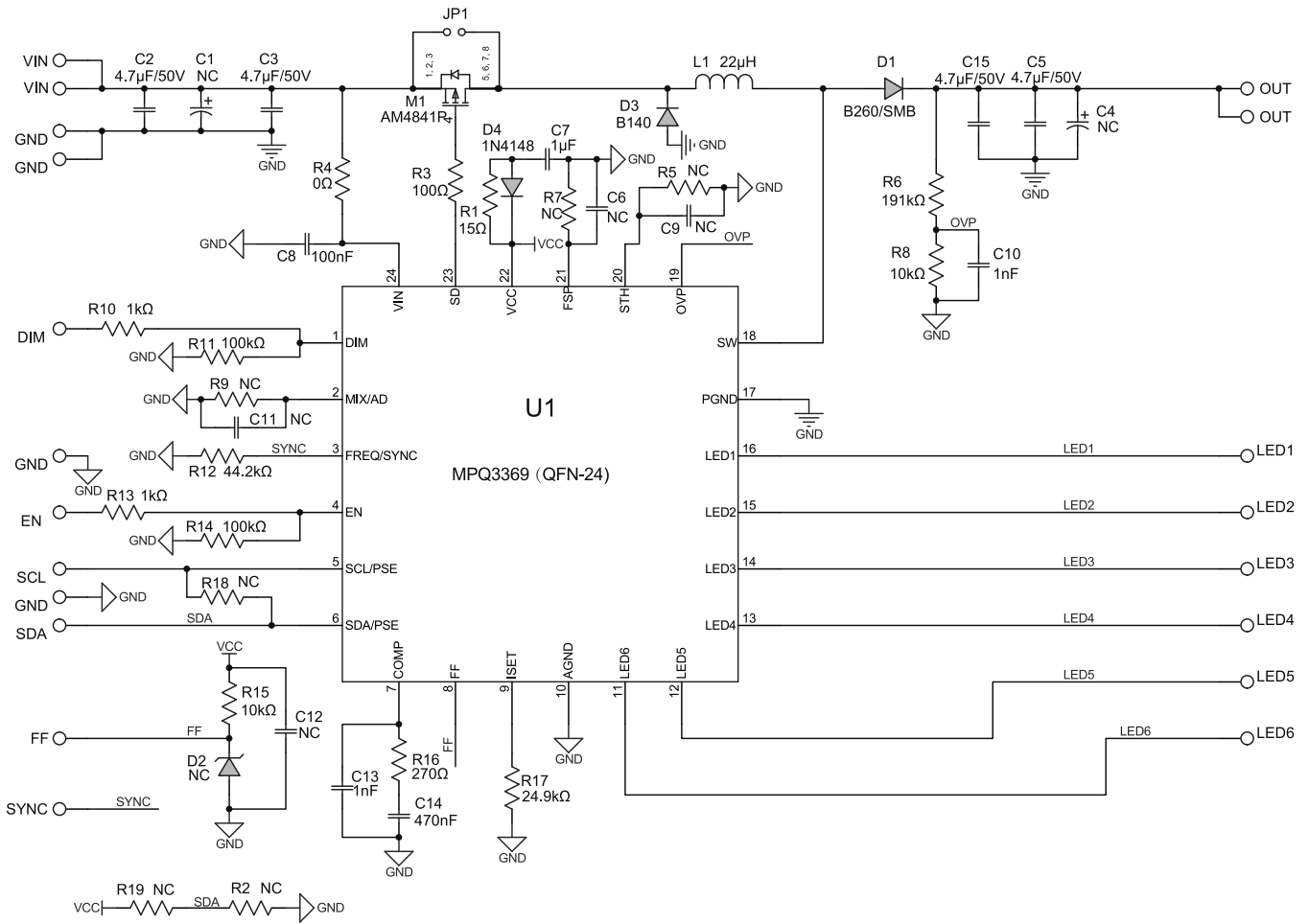


Figure 2: Evaluation Board Schematic

EVQ3369-R-01A 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/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 | MPQ3369 | 6-channel LED driver | QFN-24 (4mmx4mm) | MPS | MPQ3369GR |

PCB LAYOUT

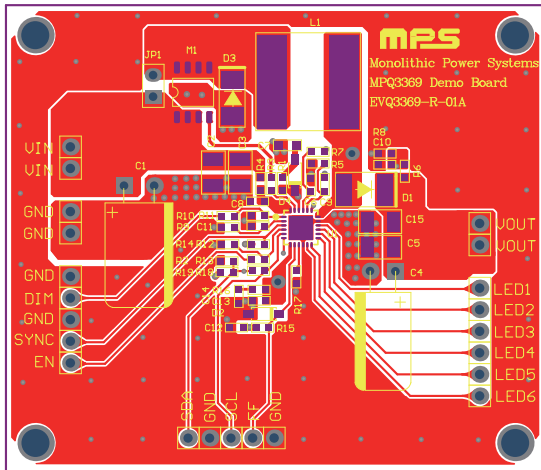


Figure 3: Top Layer

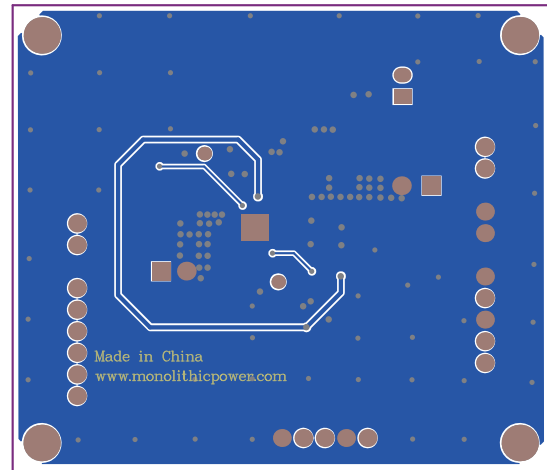


Figure 4: Bottom Layer

Revision History

| Revision # | Revision Date | Description | Pages Updated |
|------------|---------------|-----------------|---------------|
| 1.0 | 12/3/2020 | Initial Release | - |

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