



EVQ3364-R-00A

36V, 150mA, 4-Channel, Boost WLED Driver with 15000:1 Dimming Ratio and I²C Evaluation Board, AEC-Q100 Qualified

DESCRIPTION

The EVQ3364-R-00A is an evaluation board designed to demonstrate the capabilities of the MPQ3364, a four-channel step-up converter designed to drive white LED (WLED) arrays as backlighting for small or mid-sized liquid-crystal display (LCD) panels.

Peak-current control is used as the pulse-width modulation (PWM) control architecture for regulating the boost converter. Four channel-current sources are applied to the LED cathode to adjust the LED brightness. This 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 maximum current per channel is 150mA.

The MPQ3364's low on resistance MOSFET and low headroom voltage design improves efficiency. The device also has a standard digital I²C interface for easy flexibility. The switching frequency (f_{sw}) can be configured via a resistor, I²C interface, or external clock.

The MPQ3364 features three dimming modes: analog dimming, PWM dimming, and mixed dimming via the PWM input. The dimming mode can be selected via the I²C interface or MIX/AD pin. The IC also has a phase shift function that eliminates noise during PWM dimming.

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

The MPQ3364 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		4 strings	
LED current (per string)	I _{LED}	50	mA

FEATURES

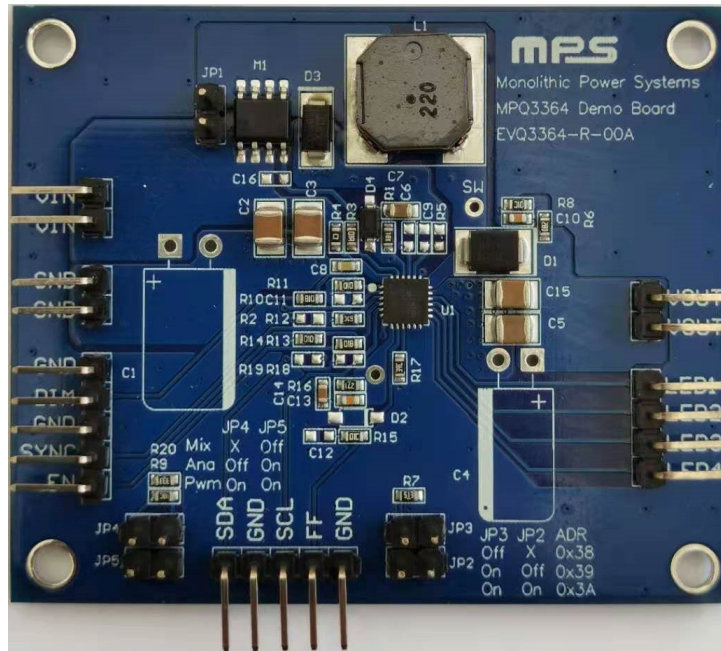
- 3.5V to 36V Input Voltage Range
- 4 Channels with 150mA Max per Channel
- Internal 100mΩ, 50V MOSFET
- Up to 2.2MHz Configurable Switching Frequency (f_{sw})
- Optional f_{sw} Follows the External Clock
- Multiple Dimming Modes through the PWM Input:
 - PWM Dimming
 - Analog Dimming
 - Mixed Dimming with 25% or 12.5% Transfer Point
- 15000:1 Dimming Ratio during PWM Dimming when f_{PWM} ≤ 200Hz
- 200:1 Dimming Ratio during Analog Dimming via PWM 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}
- Optional LED Current Auto-Decrement at High Temperatures
- LED Short Protection, LED Open Protection, Over-Temperature Protection (OTP), Over-Current Protection (OCP), and Inductor Short Protection
- Configurable LED Short Threshold and Over-Voltage (OV) Threshold
- Fault Indication Signal Output
- Available in a QFN-24 (4mmx4mm) Package
- Available in AEC-Q100 Grade 1

APPLICATIONS

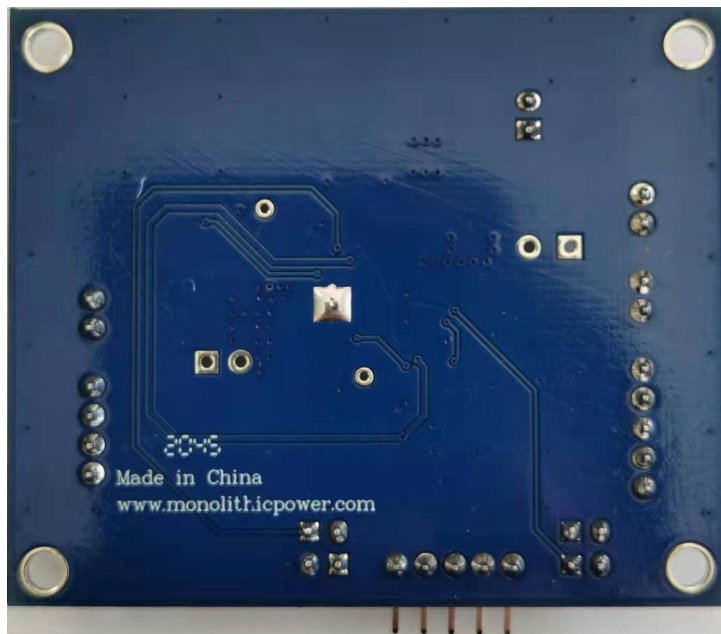
- Tablets
- Notebooks
- Automotive Displays

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EVQ3364-R-00A EVALUATION BOARD



Top Layer



Bottom Layer

LxW (6.35cmx5.25cm)

Board Number	MPS IC Number
EVQ3364-R-00A	MPQ3364GRE

QUICK START GUIDE

1. Preset the power supply between 3.5V and 36V, then turn off the power supply.
2. Connect the LED load (4 strings) terminals to:
 - a. Positive (+): LED+
 - b. Negative (-): LED1~4 pins
3. Pull EN high to turn the converter on; pull EN low to turn it off.
4. Add a 100Hz to 20kHz PWM pulse frequency (f_{PWM}) 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).
6. Write and read the registers:
 - a. Select the correct IC address.
 - b. Check that the I²C kit is communicating with the computer. If the message “USB is not connected” appears on the GUI ⁽¹⁾, then the I²C kit cannot communicate with the computer (see Figure 1). Otherwise, the communication should be functioning properly.
 - c. Select the parameters that are to be changed.
 - d. After setting the desired parameters, click the “WRITE ALL” button to send the data to the IC.
 - e. Click the “READ ALL” button and check that the data has been written to the IC.

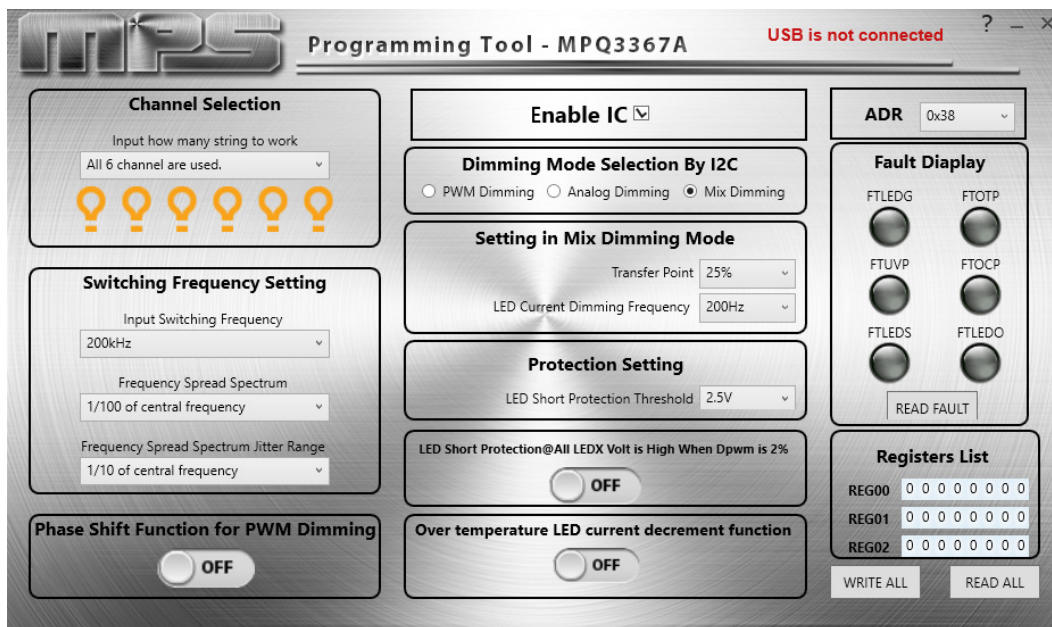


Figure 1: MPQ3364 GUI

Note:

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

EVQ3364-R-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	NC	Electrolytic capacitor, 50V	DIP		
4	C2, C3, C5, C15	4.7 μ F	Ceramic capacitor, 50V, X7R	1210	Murata	GCM32ER71H475KA55L
1	C4	22 μ F	Electrolytic capacitor, 50V	DIP		
1	C7	1 μ F	Ceramic capacitor, 25V, X7R	0805	Murata	GCM21BR71E105KA56L
1	C8	100nF	Ceramic capacitor, 50V, X7R	0603	TDK	GCM188R71H104KA57D
5	C6, C9, C11, C12, C16	NC	Ceramic capacitor	0603		
2	C10, C13	1nF	Ceramic capacitor, 16V, X7R	0603	Würth	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	DIP	Any	
1	L1	22 μ H	Inductor, 22 μ H, 68.1m Ω , I _{SAT} = 4.2A	SMD	Murata	1274AS-H-220M=P3
1	M1	9A	P-channel MOSFET, -40V	SO8	Analog Power	AM4841P
1	R1	15 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0715RL
4	R2, R5, R18, R19	NC	Film resistor, 1%	0603		
1	R3	100 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07100RL
1	R4	0 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	R6	191k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07191KL
1	R7	51k Ω	Film resistor, 1%	0603	Synton-Tech	RC0603FR-0751KL
2	R8, R15	10k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R9	30.9k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0730K9L
2	R10, R13	1k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-071KL
2	R11, R14	100k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R12	44.2k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0744K2L
1	R16	270 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07270RL
1	R17	24.9k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0724K9L
1	R20	33k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0733KL
1	U1	MPQ3364	4-channel LED driver	QFN-24 (4mmx4mm)	MPS	MPQ3364GRE

PCB LAYOUT

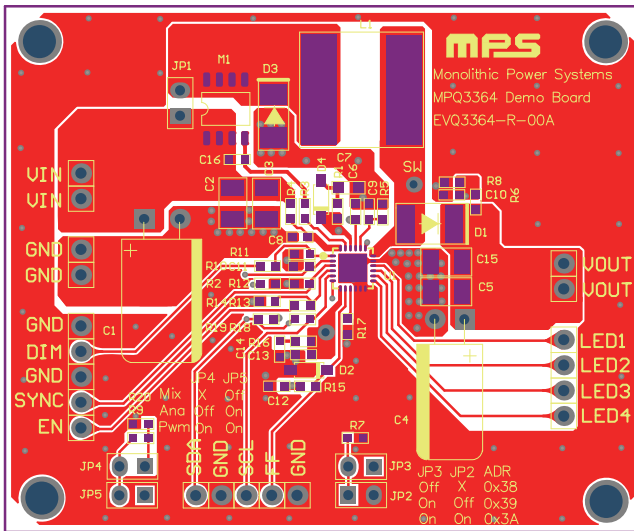


Figure 3: Top Layer

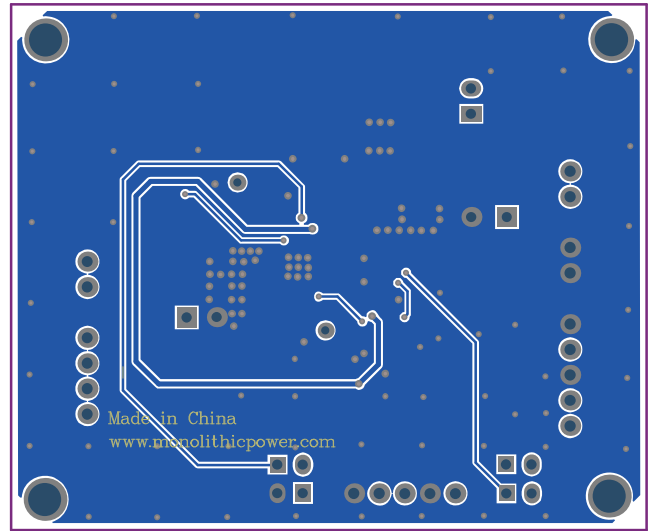


Figure 4: Bottom Layer