



EVQ3364-R-01A

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

DESCRIPTION

The EVQ3364-R-01A 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 improve efficiency. The device also has a standard, digital I²C interface for easy flexibility. The switching frequency (f_{sw}) can be configured via a resistor, the I²C interface, or an 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 the 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.

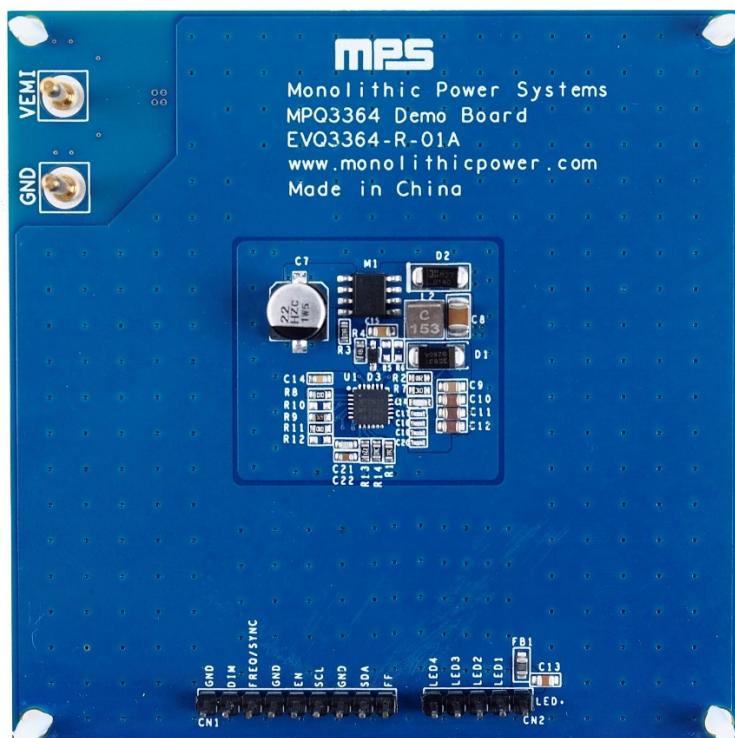
It is recommended to read the MPQ3364 datasheet prior to making any changes to the EVQ3364-R-01A.

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3.5V to 36V
Output voltage (V_{LED})	$V_{IN} = 3.5\text{V to } 36\text{V}$	<50V
LED strings	$V_{IN} = 3.5\text{V to } 36\text{V}$	4 strings
LED current (I_{LED})	$V_{IN} = 3.5\text{V to } 36\text{V}$, $R_{ISET} = 24.9\text{k}\Omega$	50mA/string

EVALUATION BOARD



LxW (8.38cmx8.38cm)

Board Number	MPS IC Number
EVQ3364-R-01A	MPQ3364GR

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
3. Pull EN high to turn the converter on; pull EN low to turn it off.
4. Apply a 100Hz to 20kHz pulse-width modulation (PWM) frequency (f_{PWM}) to the PWM terminal.

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

5. Connect the evaluation board's SCL, SDA, and GND pins to the I²C kit's (EVKT-USBI2C-02) SCL, SDA, and GND pins.
6. Follow the steps below to write and read the registers:
 - a. Select the correct IC address.
 - b. Check that the I²C kit is connected to the PC properly. If the message "USB is not connected" appears in the top right of the GUI⁽¹⁾, then the I²C kit is not connected properly and cannot communicate with the PC (see Figure 1). Otherwise, the I²C kit is connected properly and can communicate with the PC.
 - c. Select and set the desired parameters.
 - d. After setting the parameters, click the "WRITE ALL" button to send the data to the IC.
 - e. Click the "READ ALL" button to check that the data has been written to the IC.

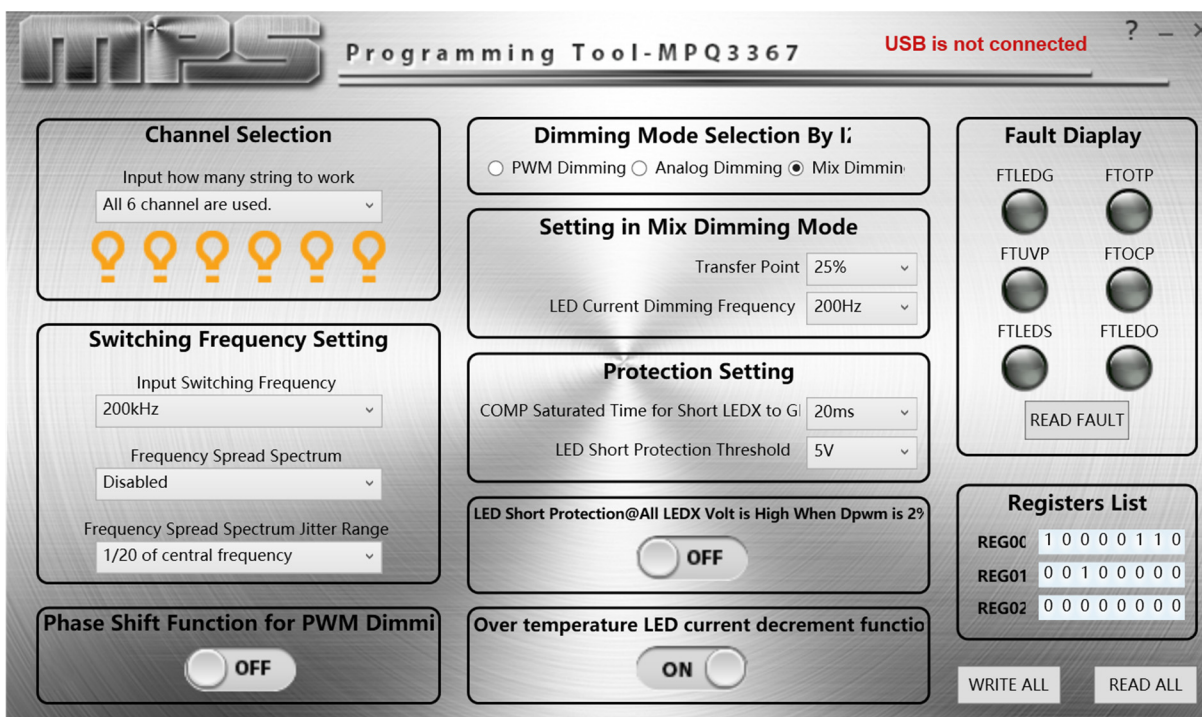


Figure 1: MPQ3367 GUI (I²C Kit Is Not Connected Properly)

Note:

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

EVALUATION BOARD SCHEMATIC

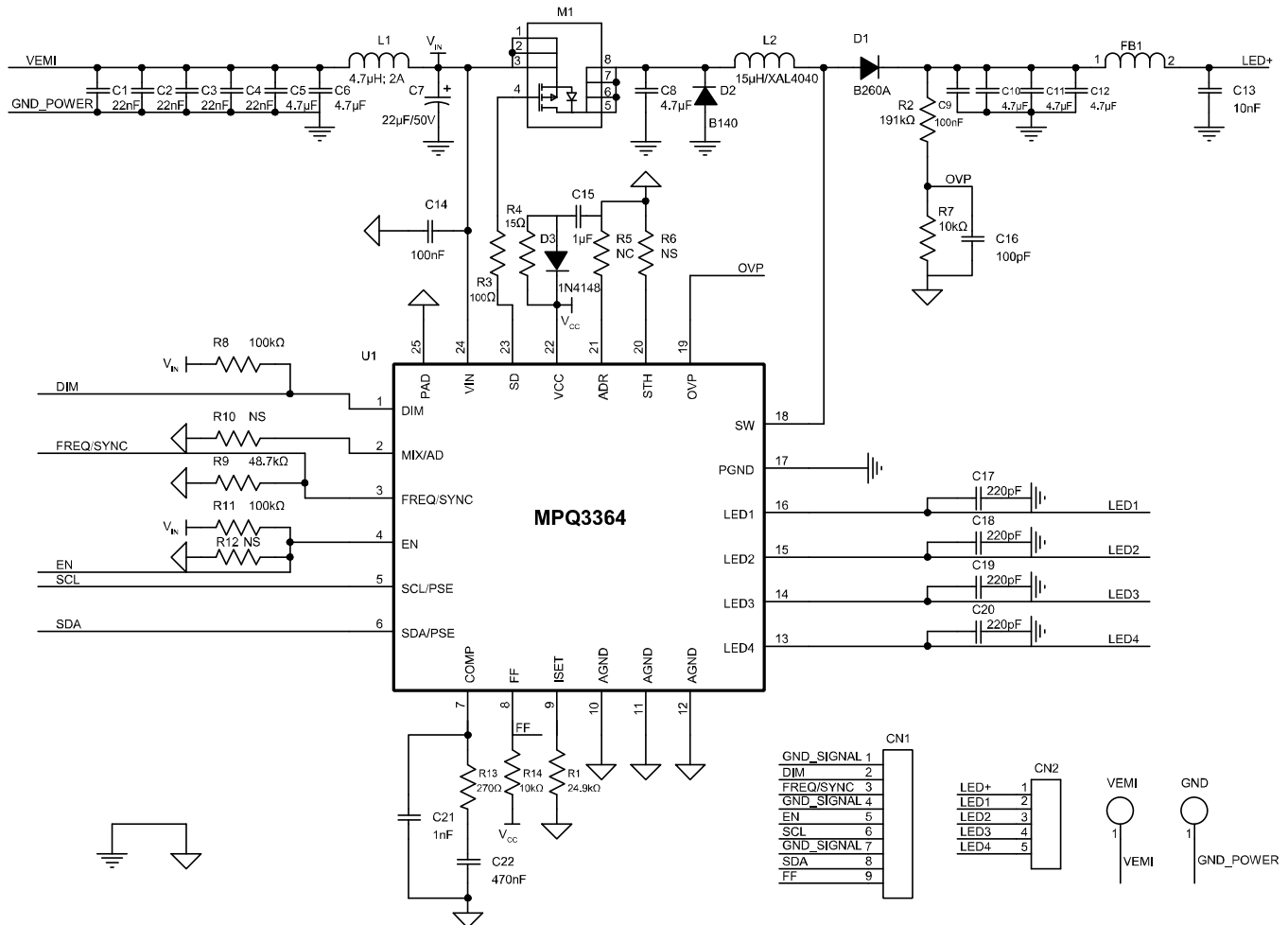


Figure 2: Evaluation Board Schematic

EVQ3364-R-01A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
4	C1, C2, C3, C4	22nF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H223KA01D
5	C5, C6, C10, C11, C12	4.7μF	Ceramic capacitor, 50V, X7S	0805	Murata	GRM21BC71H475KE11L
1	C7	22μF	Electrolytic capacitor, 50V	SMD	Panasonic	EEHZC1H220P
1	C8	4.7μF	Ceramic capacitor, 50V, X7R	1210	Murata	GCM32ER71H475KA55L
1	C9	100nF	Ceramic capacitor, 50V, X7R	0805	Murata	GRM21BR71H104KA01L
1	C13	10nF	Ceramic capacitor, 50V, X7R	0805	TDK	C2012X7R1H103K
1	C14	100nF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H104KA93D
1	C15	1μF	Ceramic capacitor, 16V, X7R	0805	Murata	GRM21BR71C105KA01
1	C16	100pF	Ceramic capacitor, 50V, C0G	0603	Samsung	CL10C101JBNC
4	C17, C18, C19, C20	220pF	Ceramic capacitor, 50V, C0G	0402	TDK	C1005C0G1H221J
1	C21	1nF	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H102JA01D
1	C22	470nF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM188R71C474KA88D
1	D1	60V	Schottky diode, 2A	SMA	Diodes, Inc.	B260A-13-F
1	D2	40V	Schottky diode, 1A	SMA	Diodes, Inc.	B140-13-F
1	D3	75V	Diode, 0.15A	SOD323	Changdian	1N4148WS
1	L1	4.7μH	Inductor, 173m Ω, 2A	SMD	MPS	MPL-AY3020-4R7
1	L2	15μH	Inductor, 120mΩ, 2.8A	SMD	Coilcraft	XAL4040-153MEB
1	FB1	1.6A	Magnetic bead	0805	Murata	BLM21SP102SN1D
1	M1	-40V	P-channel MOSFET	SO-8	Analog Power	AM4841P
1	R1	24.9kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0724K9L
1	R2	191kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07191KL
1	R3	100Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07100RL
1	R4	15Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0715RL
4	R5, R6, R10, R12	NS				
2	R7, R14	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
2	R8, R11	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R9	48.7kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0748K7L
1	R13	270Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07270RL

EVQ3364-R-01A BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	CN1	2.54mm	Connector, 9-pin	DIP	Custom	
1	CN2	2.54mm	Connector, 5-pin	DIP	Custom	
2	VEMI, GND	2mm	Connector, male	DIP	Custom	
1	U1	MPQ3364	Step-up converter	QFN-24 (4mmx4mm)	MPS	MPQ3364GR

PCB LAYOUT

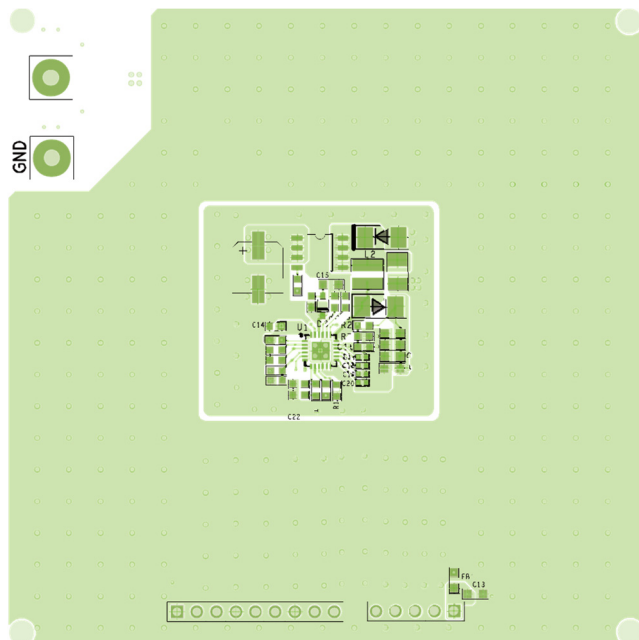


Figure 3: Top Layer

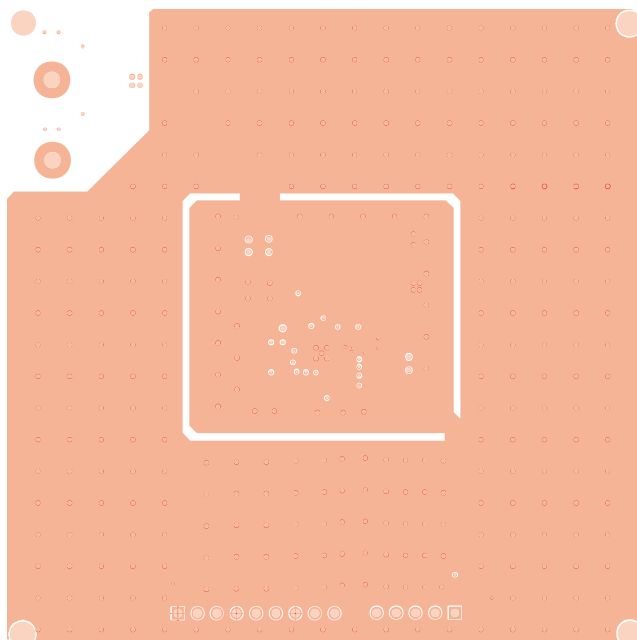


Figure 4: Mid-Layer 1

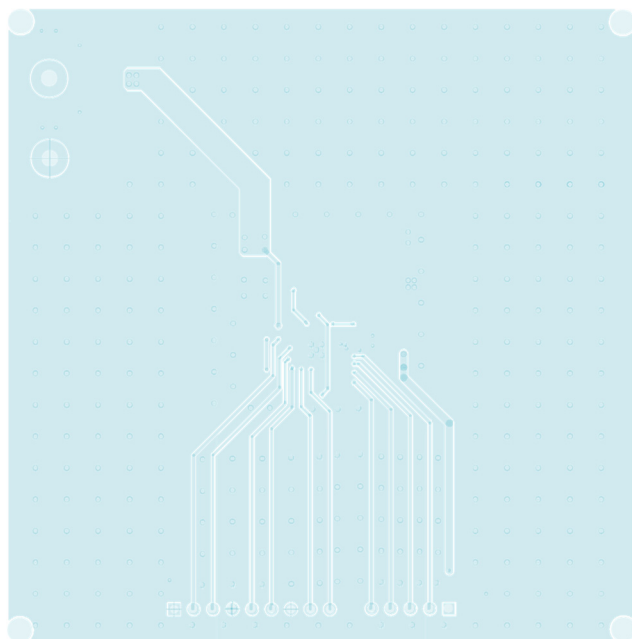


Figure 5: Mid-Layer 2



Figure 6: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	9/6/2023	Initial Release	-

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