

DESCRIPTION

The EVQ3386-R-00A is an evaluation board for the MPQ3386-R, a step-up converter designed for large liquid-crystal displays that employ an array of LEDs as the light source. It can drive up to 6 strings in parallel and 10 LEDs per string.

The MPQ3386 uses internal switch current mode, fixed frequency architecture and includes current ballast in each string terminal, which achieves 3% current regulation accuracy between strings. Low feedback voltage at each LED string help reduce power loss and improve efficiency.

The MPQ3386 has multiple features to protect the converter from fault conditions, including under-voltage lockout, current limiting, over voltage, short LED, open LED and thermal shut-down protection.

The MPQ3386 is available in small QFN24 (4mmx 4mm) package.

ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|---------------|-----------|---|-------|
| Input Voltage | V_{IN} | 4.5 – 25 | V |
| LEDs # | | 6 string parallel and 10 LEDs each string | |
| LED Current | I_{LED} | 20/string | mA |

FEATURES

- 4.5V to 25V Input Voltage Range
- Up to 89% Efficiency
- Programmable Over Voltage Protection
- Drives up to 6 Strings Parallel and 10 LEDs in Series.
- 3% Current Regulation Accuracy Between Strings
- Selectable Switching Frequency: 1.25MHz and 625kHz
- Open and Short LED Load Protection
- Thermal Shutdown

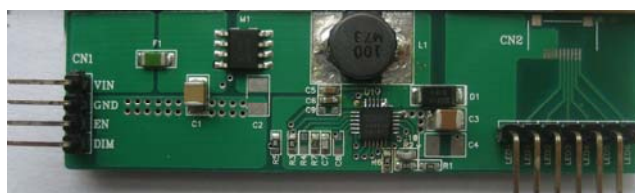
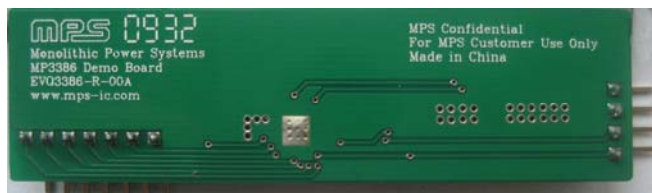
APPLICATIONS

- Notebook PC
- Automotive and Industrial
- Small LCD TV
- Handy Terminals Display
- Automotive Systems and Tablet Computer

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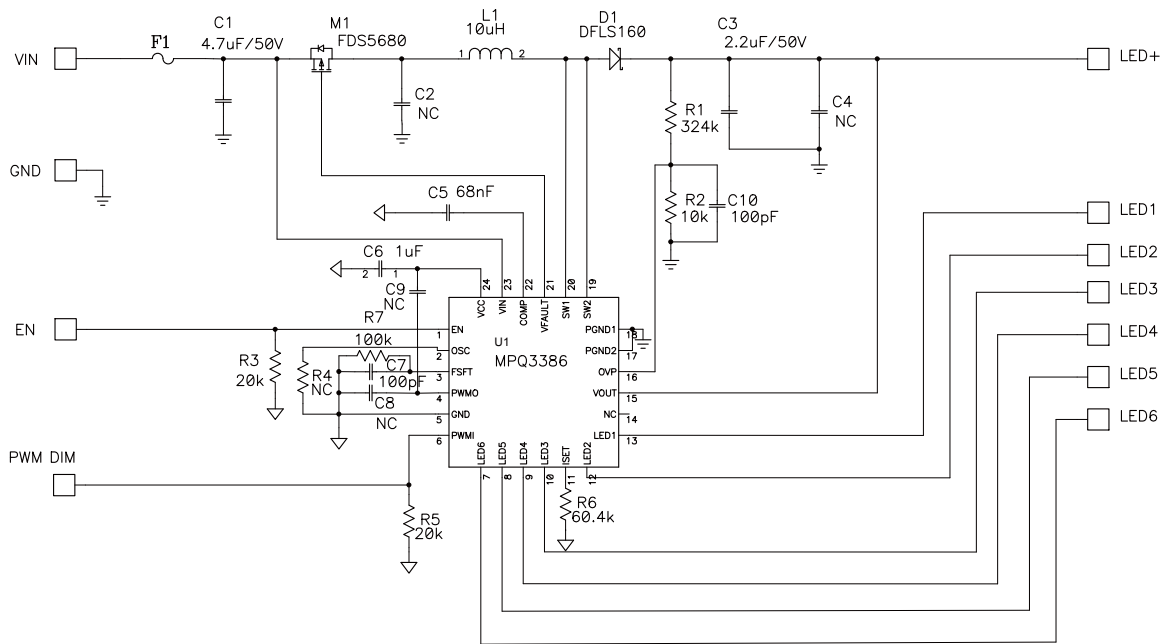
EVQ3386-R-00A EVALUATION BOARD



(L x W x H) 7.3cm x 2.0cm x 1.0cm

| Board Number | MPS IC Number |
|---------------|---------------|
| EVQ3386-R-00A | MPQ3386-R |

EVALUATION BOARD SCHEMATIC



EVQ3386-R-00A BILL OF MATERIALS

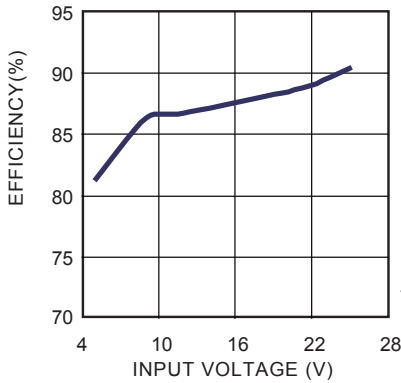
| Qty | Ref | Value | Description | Package | Manufacturer | Part Number |
|-----|---------|----------------|-----------------------------|---------|-------------------------|--------------------|
| 1 | C1 | 4.7 μ F | Ceramic Capacitor, 50V, X7R | 1210 | Murata | GRM32ER71H475KA88L |
| 2 | C2, C4 | NC | | 1210 | | |
| 1 | C3 | 2.2 μ F | Ceramic Capacitor, 50V, X7R | 1210 | TDK | C3225X7R1H225 |
| 1 | C5 | 68nF | Ceramic Capacitor, 50V, X7R | 0603 | Murata | GRM188R71H683KA93D |
| 1 | C6 | 1 μ F | Ceramic Capacitor, 16V, X5R | 0603 | Murata | GRM188R71C105KA12D |
| 2 | C7, C10 | 100pF | Ceramic Capacitor, 50V, COG | 0603 | Murata | GRM1885C1H101JA01D |
| 2 | C8, C9 | NC | | 0603 | | |
| 1 | D1 | | Diode Schottky, 60V, 1A | SMA | Diodes Inc | DFLS160-F |
| 1 | F1 | | Fuse, 2A, 63V | 1206 | Cooper Bussman | 3216FF2-R |
| 1 | L1 | 10 μ H | Inductor, 2.5A | SMD | SUMIDA | CDRH8D28NP-100NC |
| | | 10 μ H | Inductor, 2.47A | SMD | Cooper | DR73-100 |
| 1 | M1 | | P- channel MOSFET | SO8 | Fairchild Semiconductor | FDS5680 |
| 1 | R1 | 324k Ω | Resistor, 1% | 0603 | Yageo | RC0603FR-07324KL |
| 1 | R2 | 10k Ω | Resistor, 1% | 0603 | Yageo | RC0603FR-0710KL |
| 2 | R3, R5 | 20k Ω | Resistor, 5% | 0603 | Yageo | RC0603JR-0720KL |
| 1 | R4 | NC | | 0603 | | |
| 1 | R6 | 60.4k Ω | Resistor, 1% | 0603 | Yageo | RC0603FR-0760K4L |
| 1 | R7 | 100k Ω | Resistor, 1% | 0603 | Yageo | RC0603FR-07100KL |
| 1 | U1 | | LED Driver IC | QFN24 | MPS | MPQ3386-R |

EVB TEST RESULTS

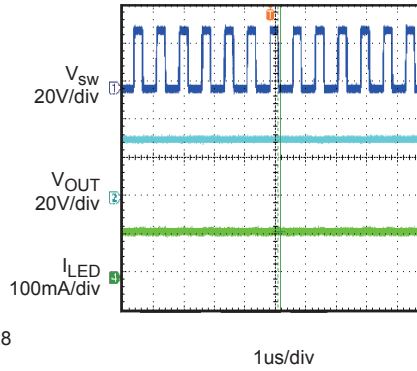
Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$, 10 LEDs in series, 6 strings parallel, 20mA/string, unless otherwise noted.

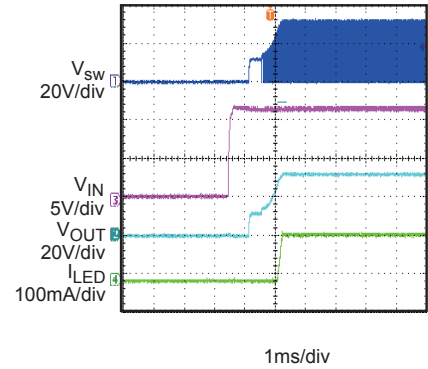
Efficiency vs. Input Voltage



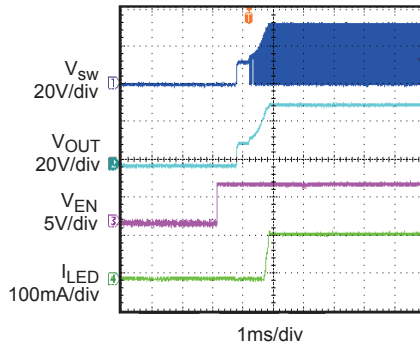
Steady State



Vin Startup

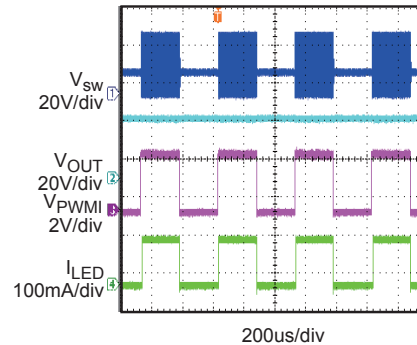


Ven Startup



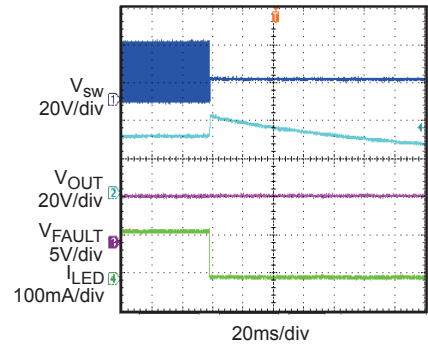
PWM Dimming

$f_{PWM} = 2kHz$, $D_{PWM} = 50\%$



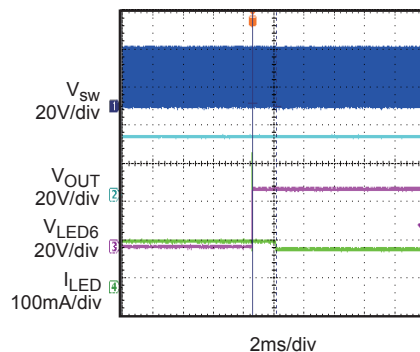
Open LED Protection

open all LED strings at working



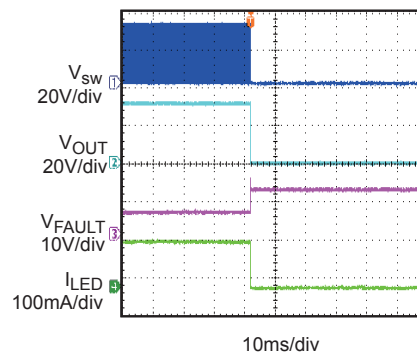
Short LED Protecton

short Vout to LEDx at working



Short LED Protection

short Vout to GND at working



PRINTED CIRCUIT BOARD LAYOUT

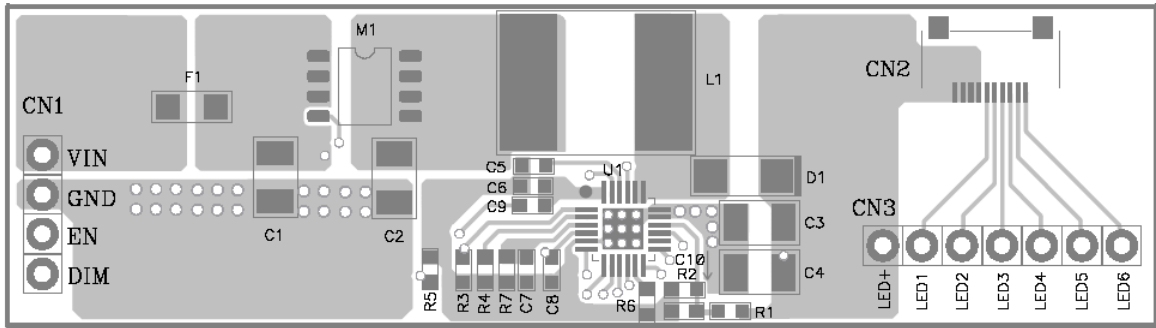


Figure 1—Top Layer

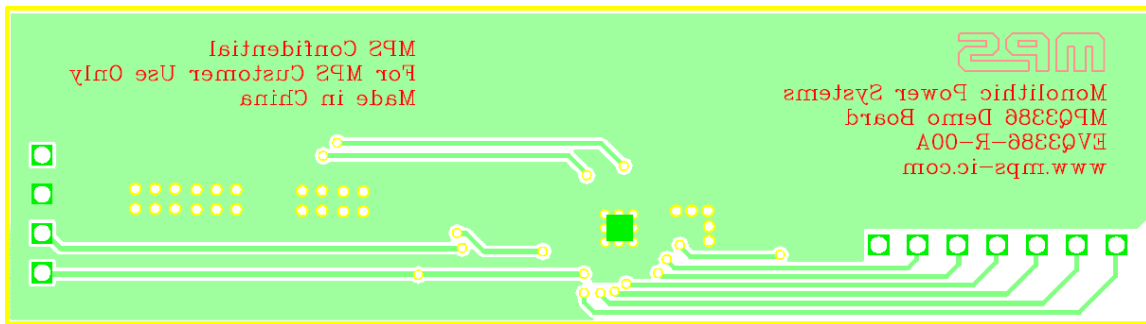


Figure 2—Bottom Layer

QUICK START GUIDE

1. Connect the positive and negative terminals of the load panel (10 white LEDs in series, 6 strings paralleled) to the LED+ and LED1~6 pins on the EV board, respectively.
2. Connect the positive and negative terminals of the power supply (4.5V ~ 25V) to the VIN and GND pins on the EV board, respectively.
3. Drive EN pin high ($2.5V < V_{EN} < 5V$) to enable the MPQ3386.
4. For PWM dimming, apply a PWM rectangular waveform with a minimum voltage less than 0.8V and a maximum greater than 1.5V on PWM DIM pin. The frequency of the PWM signal is recommended between 200Hz to 2kHz.

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