



The Future of Analog IC Technology®

EV3378E-F-00A

4-Channel WLED Controller With High-Efficiency Buck Converter Evaluation Board

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

DESCRIPTION

The MP3378E is a one-chip solution specially designed for monitor applications. The MP3378E includes a step-up WLED controller with four current channels for backlighting, and a high efficiency buck converter for internal bus voltage or standby power.

The 4-string WLED controller drives an external MOSFET to boost up the output voltage from the input supply. It regulates the current in each LED string to the programmed value set by an external current setting resistor. It supports both analog and PWM dimming independently to meet special dimming mode request. Full protection features for the WLED controller include OCP, OTP, UVP, OVP, LED short/open protection, inductor/diode short protection.

The high-efficiency buck converter operates in the current mode operation with a built-in MOSFET and a built-in synchronous rectifier. It offers a very compact solution to achieve excellent load and line regulation. Full protection features for the buck converter include OCP and thermal shutdown.

The MP3378E is available in a TSSOP-28EP package.

ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|--------------------------|-----------|---------------------------------|-------|
| Input Voltage | V_{IN} | 8– 24 | V |
| LEDs # | | 4 LED strings 10 LEDs/string | |
| LED Current | I_{LED} | 120/string | mA |
| I_{OUT} Current (buck) | I_{OUT} | 2 | A |

FEATURES

WLED Driver:

- 4-String, Max 350mA/String, WLED Controller
- Up to 24V Input Voltage Range
- 2.5% Current Matching Accuracy
- Programmable Switching Frequency
- PWM and Analog Dimming Mode
- LED Open and Short Protection
- Programmable Over-Voltage Protection
- Recoverable Thermal Shutdown Protection
- Over-Current Protection
- Over-Temperature Protection
- Inductor/Diode short Protection

Buck Converter:

- 144mΩ/58mΩ Low $R_{DS(on)}$ Internal Power MOSFETs
- Low Quiescent Current
- Fixed 235kHz Switching Frequency
- Frequency Sync from 250kHz to 2MHz External Clock
- Internal Soft Start
- OCP and Hiccup Mode
- Over-Temperature Protection
- Output Adjustable from 0.8V

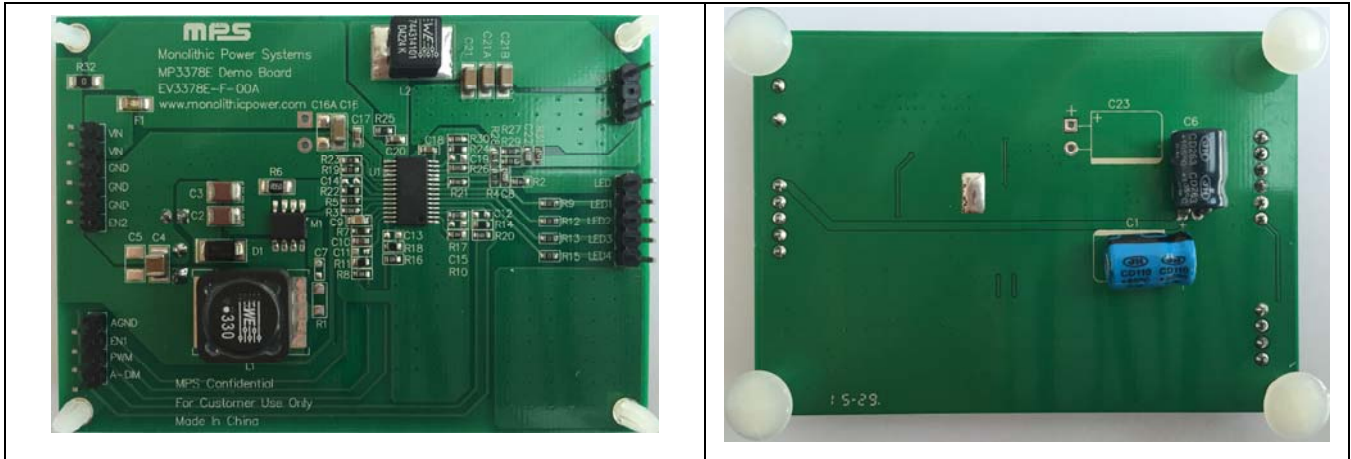
APPLICATIONS

- Desktop LCD Flat Panel Displays
- Flat Panel Video Displays
- 2D/3D LCD TVs and Monitors

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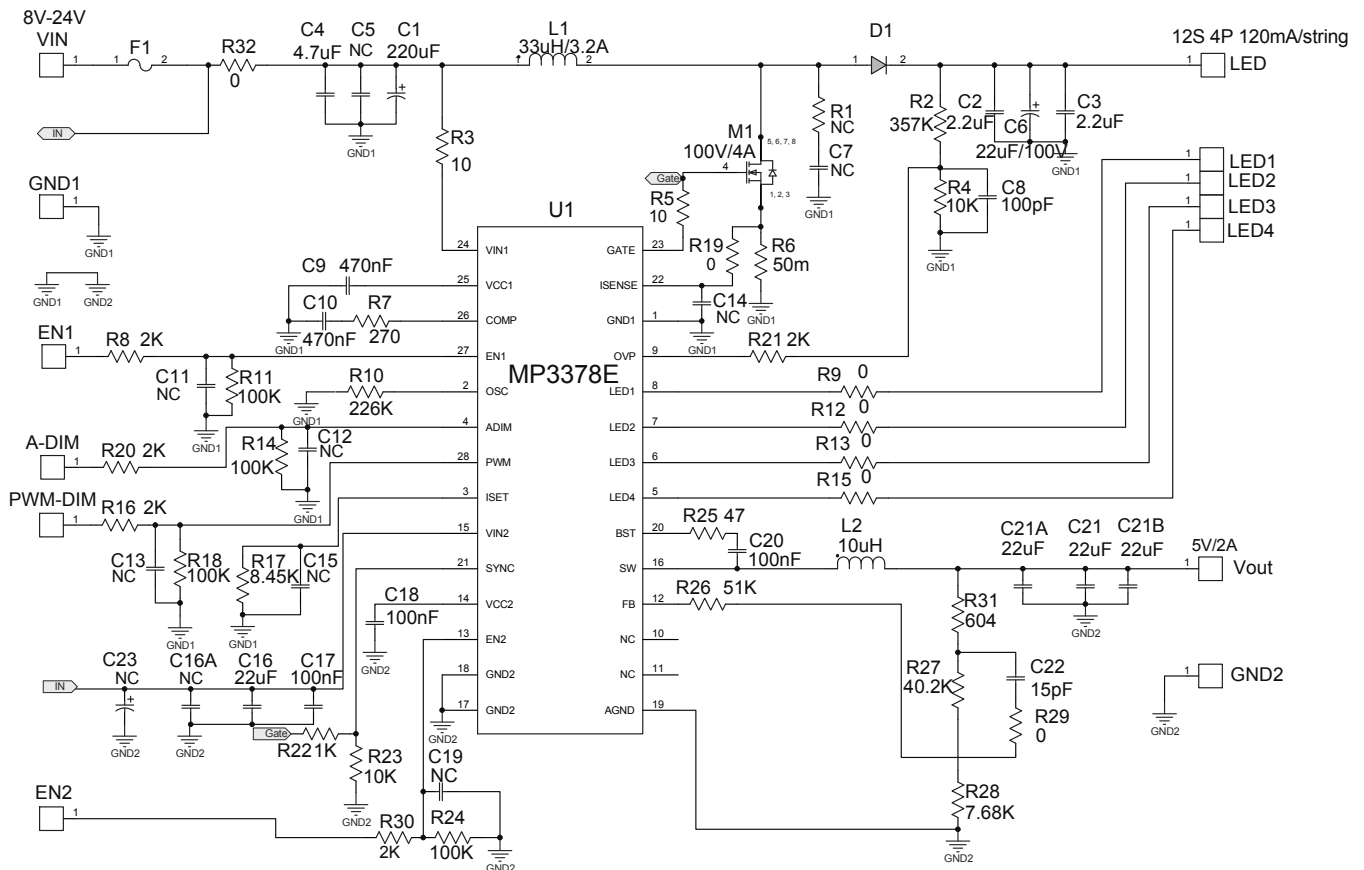
EV3378E-F-00A EVALUATION BOARD



(L x W x H) 5.9cm x 8.4cm x 2cm

| Board Number | MPS IC Number |
|---------------|---------------|
| EV3378E-F-00A | MP3378EGF |

EVALUATION BOARD SCHEMATIC



EV3378E-F-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Part Number |
|-----|--|---------------------|---|---------|--------------|--------------------|
| 1 | C1 | 220 μ F | Electrolytic Capacitor; 35V;Electrolytic;DIP | DIP | 江海 | CD110-35V220 |
| 2 | C2, C3 | 2.2 μ F | Ceramic Capacitor; 100V;X7R;1210; | 1210 | muRata | GRM32ER72A225KA35L |
| 1 | C4 | 4.7 μ F | Ceramic Capacitor; 50V;X7R | 1210 | TDK | C3225X7R1H475K |
| 1 | C6 | 22 μ F /100V | 22 μ ;100V | DIP | 江海 | CD263-100V22' |
| 1 | C8 | 100pF | Ceramic Capacitor; 50V;C0G;0603; | 0603 | muRata | GRM1885C1H101JA01D |
| 1 | C9 | 470nF | Ceramic Capacitor; 16V;X7R | 0805 | muRata | GRM21BR61C474KA01L |
| 1 | C10 | 470nF | Ceramic Capacitor; 16V;X7R;0603; | 0603 | TDK | C1608X7R1C474K |
| 1 | C16 | 22 μ F | Ceramic Capacitor; 25V;X5R; | 1206 | muRata | GRM31CR61E226KE15 |
| 3 | C17, C18, C20 | 100nF | Ceramic Capacitor; 25V;X7R;0603; | 0603 | muRata | GRM188R71E104KA01D |
| 3 | C21, C21A, C21B | 22 μ F | Ceramic Capacitor; 6.3V;X5R;1206 | 1206 | TDK | C3216X5R0J226M |
| 1 | C22 | 15pF | Ceramic Capacitor; 50V;C0G;0603; | 0603 | TDK | C1608C0G1H150J |
| 1 | C5 | NC | | 1210 | | |
| 6 | C7, C11, C12, C13, C14, C15, C19 | NC | | 0603 | | |
| 1 | C16A | NC | | 1206 | | |
| 1 | C23 | NC | | DIP | | |
| 1 | D1 | B160 | Schottky Diode;60V;1A; | SMA | Diodes | B160 |
| 1 | F1 | 042900 5.WRM | Fuse;24V;5A; | 1206 | littlefuse | 0429005.WRM |
| 1 | L1 | 33 μ H /3.5A | Inductor;33 μ H; 33m;3.5A | SMD | Würth | 744314101 |
| 1 | L2 | 10 μ H | Inductor;10 μ H; 36m;3.2A | SMD | TMP | SPC-08045-100GP |
| 1 | M1 | AM449 0N | N-Channel Mosfet; 100V;92;12.5;5.2 | SO-8 | Analog Power | AM4490N |

EV3378E-F-00A BILL OF MATERIALS (continued)

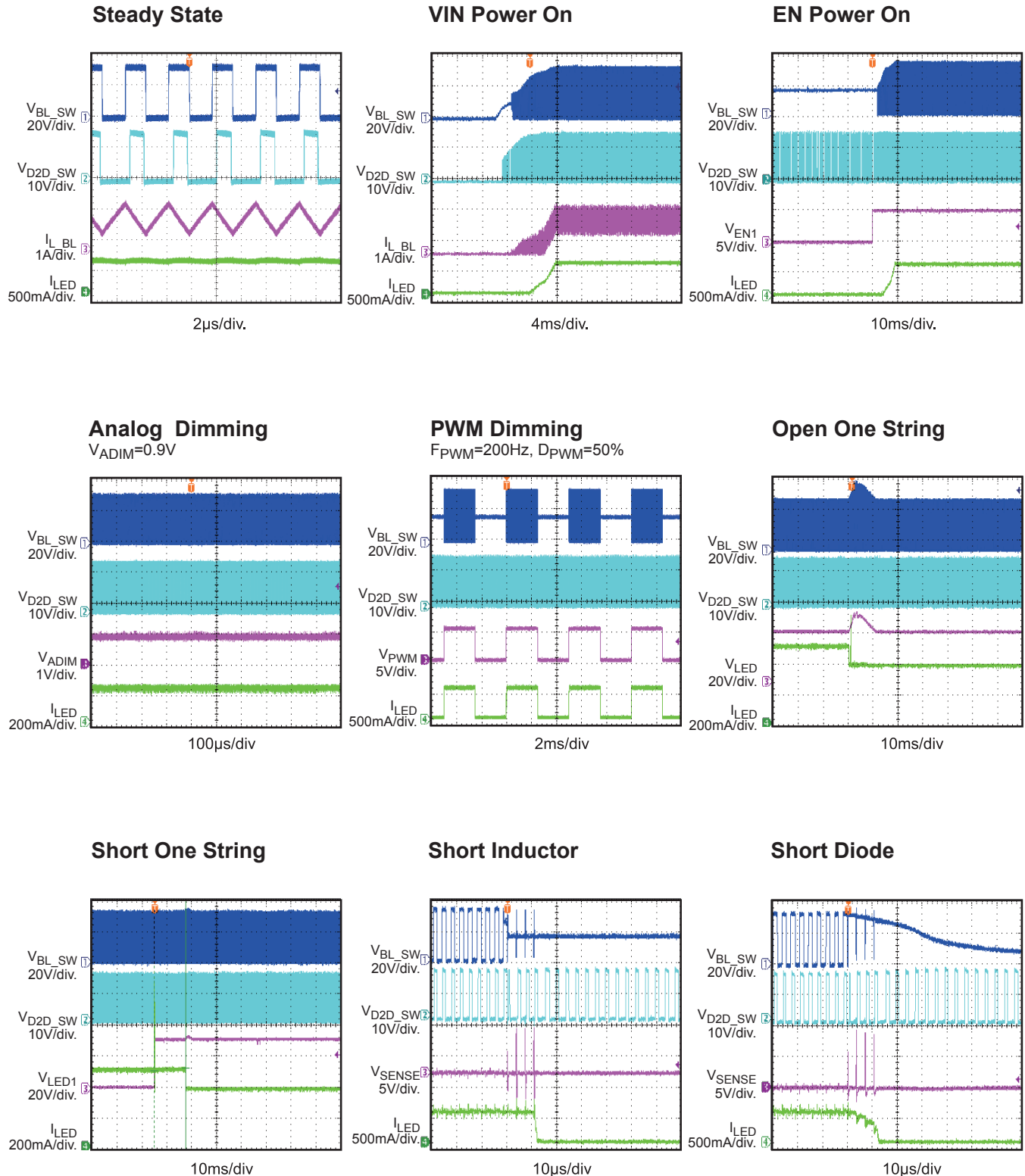
| Qty | Ref | Value | Description | Package | Manufacturer | Part Number |
|-----|--|-------|-------------------|---------------|--------------|------------------|
| 1 | R2 | 357k | Film Resistor;1% | 0603 | Yageo | RC0603FR-07357KL |
| 1 | R3 | 10 | Film Resistor;1%; | 0603 | Yageo | RC0603FR-0710RL |
| 2 | R4, R23 | 10k | Resistor;1% | 0603 | Yageo | RC0603FR-0710KL |
| 7 | R5, R9, R12, R13, R15, R19, R29 | 0 | Film Res., 1% | 0603 | Yageo | RC0603FR-070RL |
| 1 | R6 | 50m | Film Resistor;1%; | 1206 | Yageo | RL1206FR-070R05L |
| 1 | R7 | 270 | Film Resistor;1% | 0603 | Yageo | RC0603FR-07270RL |
| 4 | R8, R16, R20, R21, R30 | 2k | Film Resistor;1%; | 0603 | Yageo | RC0603FR-072KL |
| 1 | R10 | 226k | Film Resistor;1% | 0603 | Yageo | RC0603FR-07226KL |
| 3 | R11, R14, R18,R24 | 100k | Film Resistor;1%; | 0603 | Yageo | RC0603FR-07100KL |
| 1 | R17 | 8.45k | Film Resistor;1% | 0603 | Yageo | RC0603FR-078K45L |
| 1 | R22 | 1k | Film Resistor;1% | 0603 | Yageo | RC0603FR-071KL |
| 1 | R25 | 47 | Film Resistor;1%; | 0603 | Yageo | RC0603FR-0747RL |
| 1 | R26 | 51k | Film Resistor;1% | 0603 | SYNTON-TECH | RC0603FR-0751KL |
| 1 | R27 | 40.2k | Film Resistor;1%; | 0603 | Yageo | RC0603FR-0740K2L |
| 1 | R28 | 7.68k | Film Resistor;1% | 0603 | Yageo | RC0603FR-077K68L |
| 1 | R31 | 604 | Film Resistor;1% | 0603 | Yageo | RC0603FR-07604RL |
| 1 | R32 | 0 | Resistor;1%;1/4W; | 1206 | Yageo | RC1206FR-070RL |
| 1 | R1 | NC | Film Res., 1% | 0603 | | |
| 1 | U1 | | MP3378E' | TSSOP 28EP | MPS | |

EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

WLED Controller Section:

$V_{IN} = 16V$, 10 LEDs in series, 4 strings parallel, 120mA/string, $T_A = 25^{\circ}C$, unless otherwise noted.

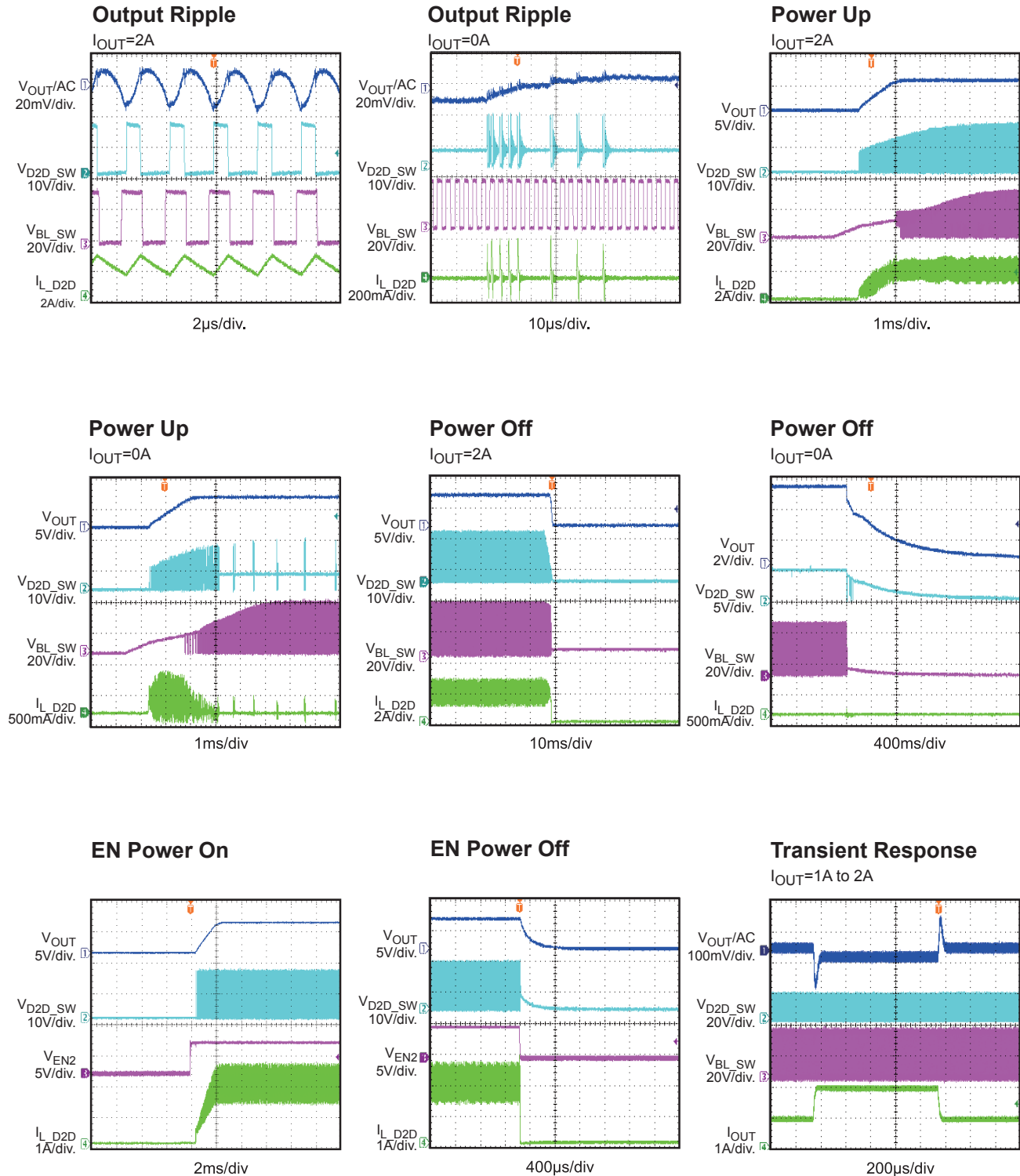


EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

Buck Converter Section:

$V_{IN} = 16V$, $V_{OUT} = 5V$, $L_2 = 10\mu H$, $T_A = 25^\circ C$, unless otherwise noted.



PRINTED CIRCUIT BOARD LAYOUT

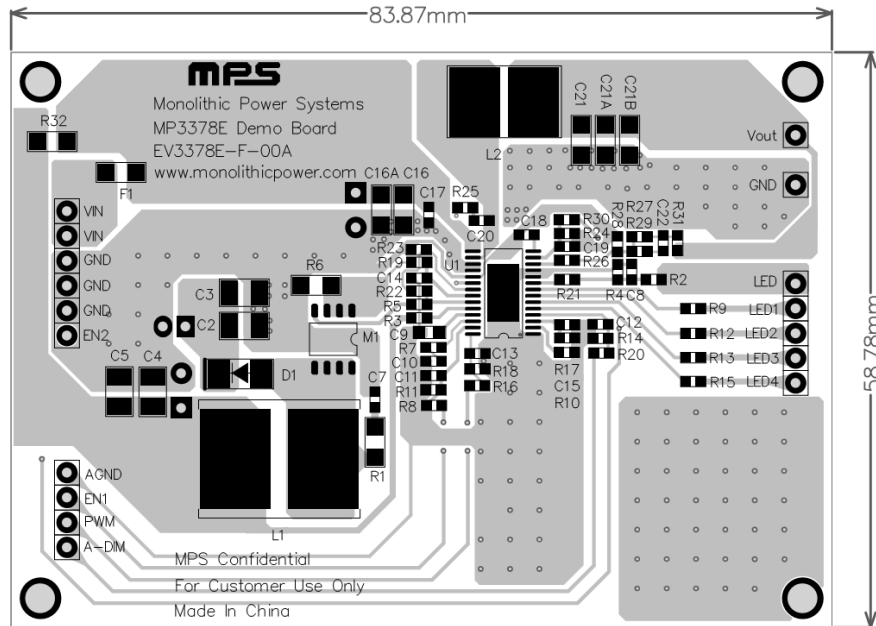


Figure 1—Top Layer

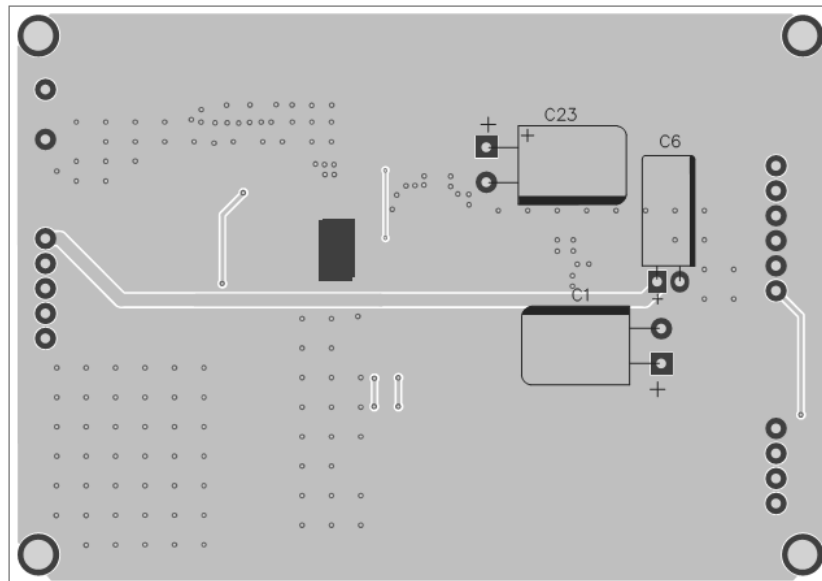


Figure 2—Bottom Layer

QUICK START GUIDE

1. For boost LED driver, connect the positive and negative terminals of the load panel (10 white LEDs in series, 4 strings) to the LED+ and LED-1~4 pins on the EV board, respectively;
For buck converter, connect the load between Vout to GND.
2. Connect the positive and negative terminals of the power supply (8V ~ 24V) to the VIN and GND pins on the EV board, respectively.
3. Drive EN1 pin high (5V) to enable the Boost and EN2 pin high to enable the Buck.
4. For PWM dimming, apply a PWM rectangular waveform with a minimum voltage less than 0.4V and a maximum greater than 1.5V on PWM pin (if using PWM pin, need pull ADIM pin to high level). The frequency of the PWM signal is recommended between 200Hz to 2kHz.
5. For analog dimming, apply a DC waveform with a voltage between 0.4 and 1.5V on ADIM pin or a PWM rectangular waveform with a minimum voltage less than 0.4V and a maximum greater than 1.5V on ADIM pin, The frequency of the PWM signal is recommended $\geq 20\text{kHz}$.

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