EV3314-R-00A

6-Channel, 60mA, 50V, Boost WLED Driver with I²C Interface Evaluation Board

DESCRIPTION

The EV3314-R-00A evaluation board is designed to demonstrate the capabilities of the MP3314, a boost converter with six channel current sources that drives WLED arrays for LCD panels in tablets and notebook backlighting applications.

The MP3314 supports a 3V to 30V input voltage (V_{IN}) range and an output voltage (V_{OUT}) up to 43V. The device uses peak current mode control and pulse-width modulation (PWM) control to maintain boost converter regulation. The six integrated LED current source channels support a maximum of 60mA per channel.

The MP3314 employs a standard I²C digital interface to set the operation mode, switching frequency (f_{SW}), dimming mode and duty, phase shift, spread spectrum, and various protection thresholds.

To improve EMI performance, the MP3314 supports a configurable switching slope and spread spectrum function. The device also features high efficiency due to low headroom voltage for LED regulation and the switching MOSFET's small on resistance ($R_{DS(ON)}$).

For system reliability, the MP3314 integrates rich protection features, including LED open protection, LED short protection, over-current protection (OCP), over-voltage protection (OVP), and over-temperature protection (OTP).

The MP3314 is available in QFN-24 (4mmx4mm) and CSP-20 (2.4mmx1.74mm) packages. The EV3314-R-00A is a fully assembled evaluation board.

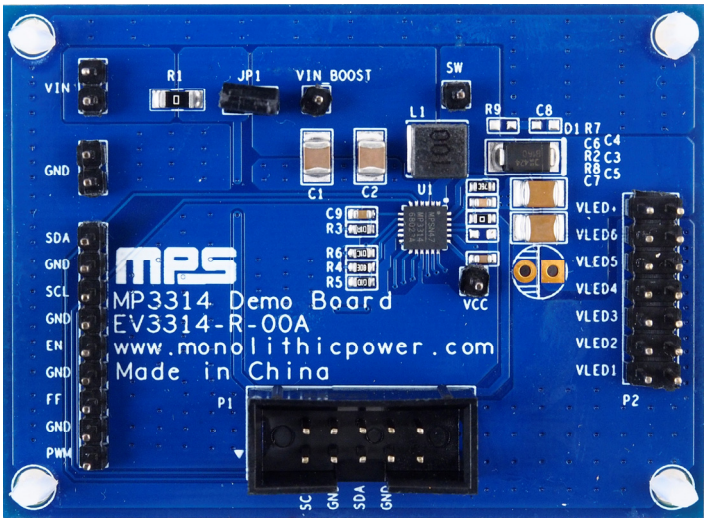
PERFORMANCE SUMMARY

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3V to 30V
Output voltage (V_{OUT})	Over-voltage protection (OVP) can be configured via the I²C interface	Max V_{OUT} < 43V
LED string	Each channel can be enabled and disabled via the I²C interface	6 strings
Maximum LED current (I_{LED})	R_{ISET} = 50kΩ (ISET_EN = 1b) and IMAX[2:0] = 111b	60mA per channel

MPL Optimized Performance with MPS Inductor MPL-SE5040 Series

EV3314-R-00A EVALUATION BOARD



LxWxH (6.5cmx4.8cmx2cm)

Board Number	MPS IC Number
EV3314-R-00A	MP3314GR

QUICK START GUIDE

1. Preset the voltage source placed between the VIN and PGND terminals to between 3V and 30V.
2. Connect the LED (6 strings) load terminals to:
   a. Positive (+): LED+ terminal
   b. Negative (-): LED1, LED2, LED3, LED4, LED5, and LED6 terminals
3. Pull the EN pin high to enable the device.
4. Connect the SCL, SDA, and GND pins of the evaluation board to the SCL, SDA, and GND pins of the I²C kit, respectively.
5. Configure the registers via the I²C interface. (1)
6. Apply a pulse-width modulation (PWM) signal to the PWM terminal for brightness control. If dimming is achieved only via the I²C, then the PWM signal can be ignored.

Note:

1) Download the MP3314 configuration tool from MPS Ebench for more details on configuring the registers during evaluation.

EVALUATION BOARD SCHEMATIC

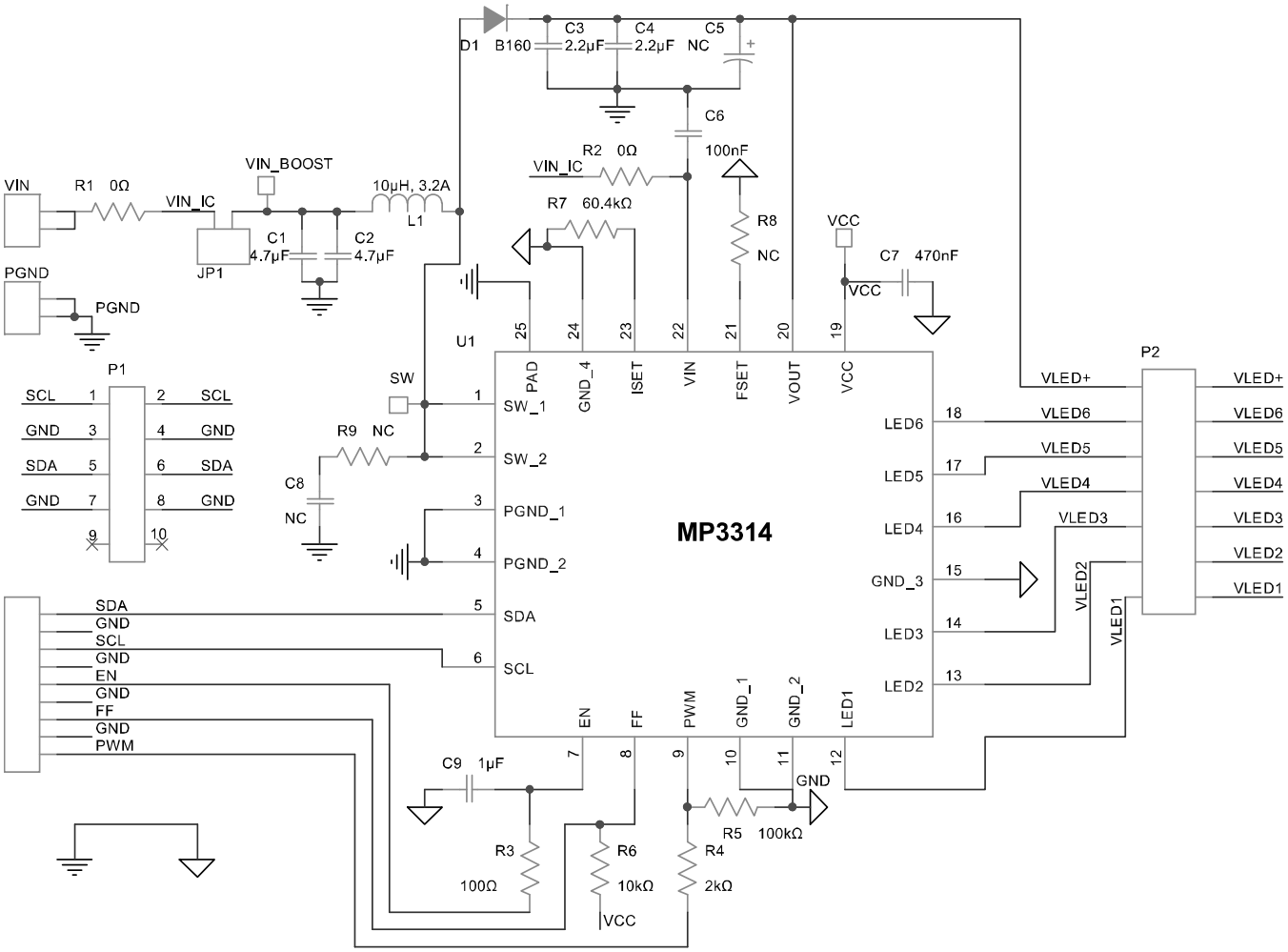


Figure 1: Evaluation Board Schematic

EV3314-R-00A BILL OF MATERIALS

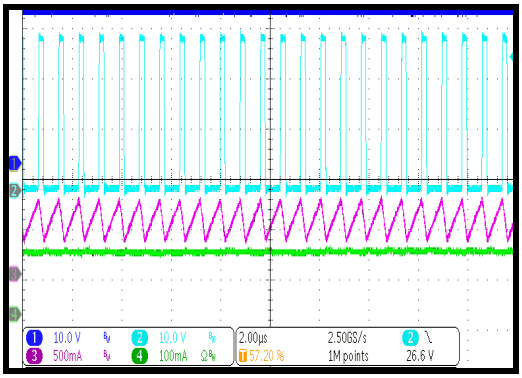
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	D1	1A	Schottky Diode, 60V	SMA	Diodes	B160-13-F
1	R1	0Ω	Film resistor, 5%	1206	Yageo	RC1206JR-070RL
1	R2	0Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	R3	100Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07100RL
1	R4	2kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-072KL
1	R5	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R6	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R7	60.4kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0760K4L
2	R8, R9	NC				
2	C1, C2	4.7μF	Ceramic capacitor, 50V, X7R	1210	Murata	GCM32ER71H475KA55L
2	C3, C4	2.2μF	Ceramic capacitor, 100V, X7R	1210	Murata	GRM32ER72A225KA35L
1	C5	NC				
1	C6	100nF	Ceramic capacitor, 50V, X7R	0603	Murata	GCJ188R71H104KA12D
1	C7	470nF	Ceramic capacitor, 16V, X7R	0603	Murata	GCM188R71C474KA55D
1	C8	NC				
1	C9	1μF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM188R71C105KA12D
3	Test Point	2.54mm	Connector, 180°	Custom	Custom	
1	VIN, GND, JP1, SDA, SCL, EN, PWM, FF	2.54mm	Connector, 180°	Custom	Custom	
1	L1	10μH	Inductor, 56mΩ, 10μH, 3.2A	SMD	MPS	MPL-SE5040-100
1	U1	MP3314	6-channel, 50V, boost WLED driver with I²C interface	QFN-24 (4mmx4mm)	MPS	MP3314GR

EVB TEST RESULTS

Performance waveforms are tested on the evaluation board, V_{IN} = 7.6V, 10 LEDs in series, 6 strings, 20mA/string, L = 10µH, T_A = 25°C, unless otherwise noted.

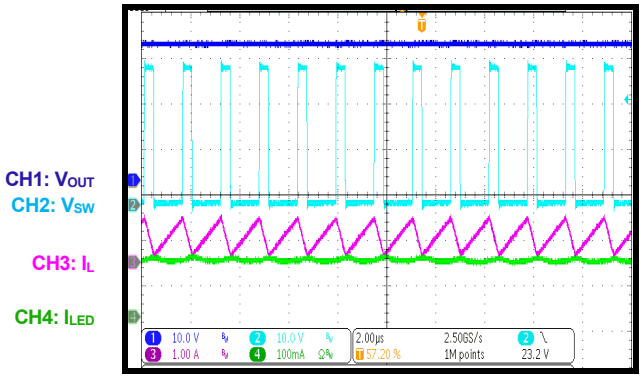
Steady State

f_{SW} = 1250kHz



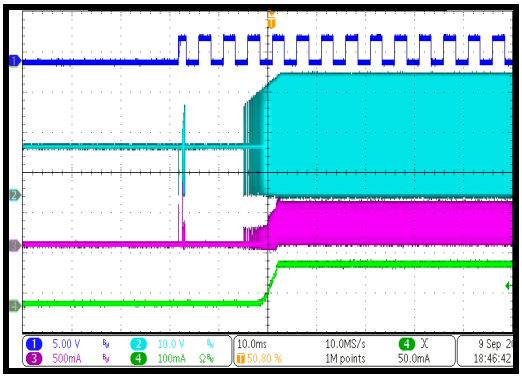
Steady State

f_{SW} = 625kHz



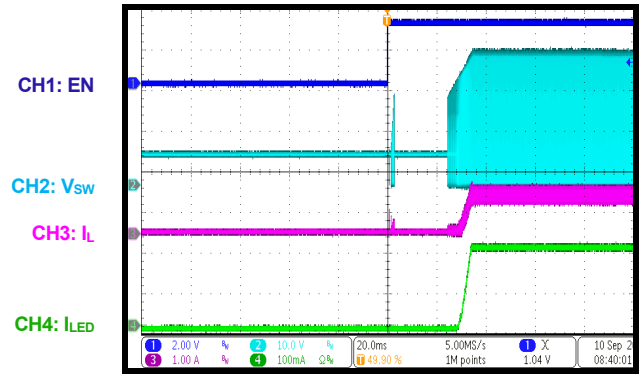
Start-Up with PWM On

V_{IN} =12V, f_{PWM} = 200Hz, duty = 50%, 30mA/string



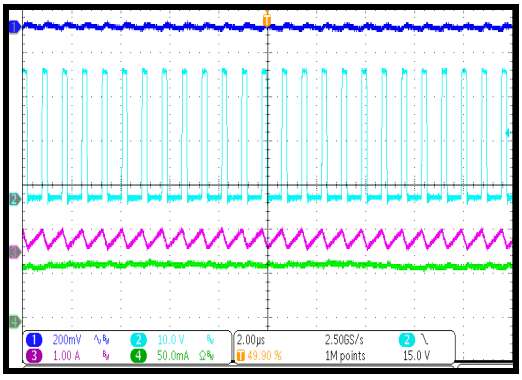
Start-Up with EN On

f_{PWM} = 200Hz, duty = 100%, 30mA/string



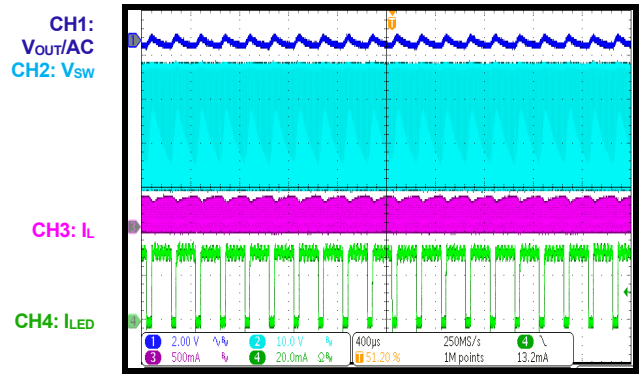
Analog Dimming

f_{PWM} = 200Hz, duty = 50%



Mix Dimming

TP = 25%, f_{ILED} = 4808Hz, f_{PWM} = 200Hz, duty = 20%

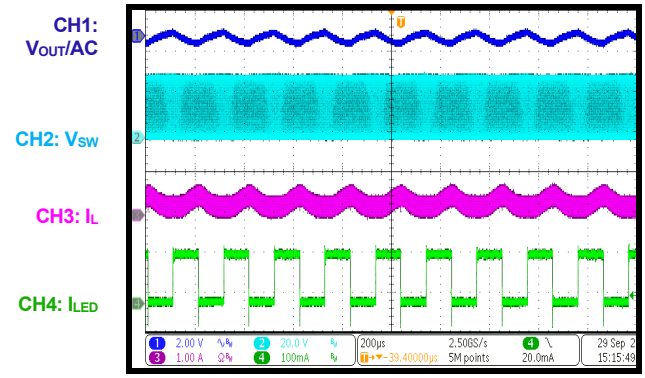


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN} = 7.6V, 10 LEDs in series, 6 strings, 20mA/string, L = 10µH, T_A = 25°C, unless otherwise noted.

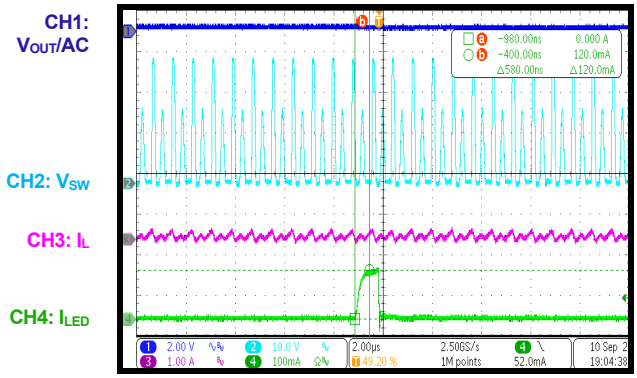
PWM Dimming

f_{ILED} = 4808Hz, f_{PWM} = 200Hz, duty = 50%



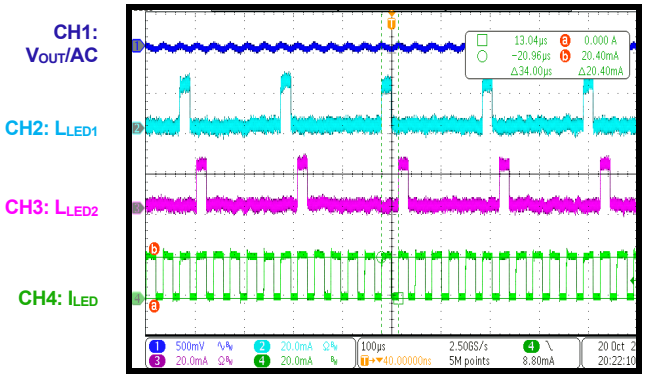
PWM Dimming

f_{ILED} = 4808Hz, f_{PWM} = 200Hz, duty = 0.5%



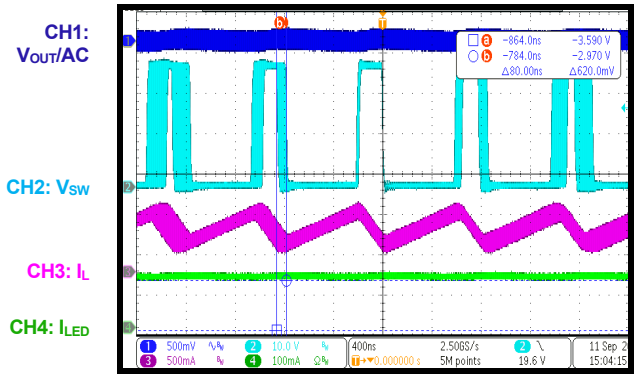
Phase Shift Function (6 Channels)

f_{ILED} = 4808Hz, f_{PWM} = 200Hz, duty = 10%



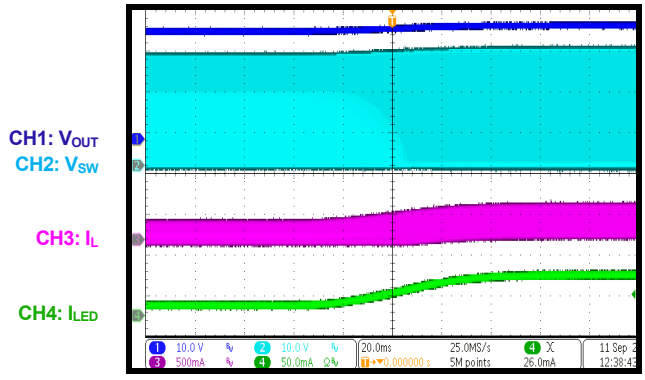
Frequency Spread Spectrum

f_{SW} = 1250kHz, f_{FSP} = 1/100 x f_{SW},
jitter range is 1/10 of f_{SW}



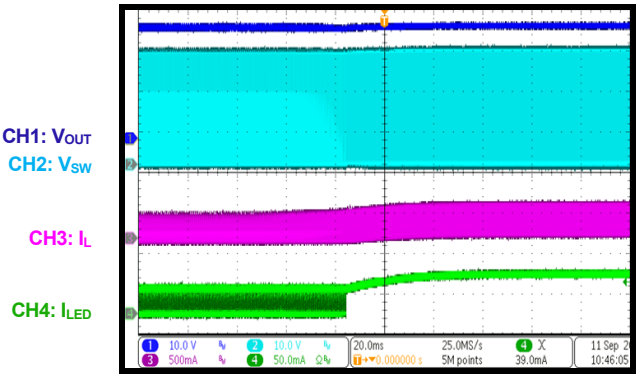
LED Current Transition and Slope

t_{TRANS} = 50ms, medium smoothing,
analog dimming, duty = 10% to 40%



LED Current Transition and Slope

t_{TRANS} = 50ms, medium smoothing,
mix dimming, duty = 10% to 40%

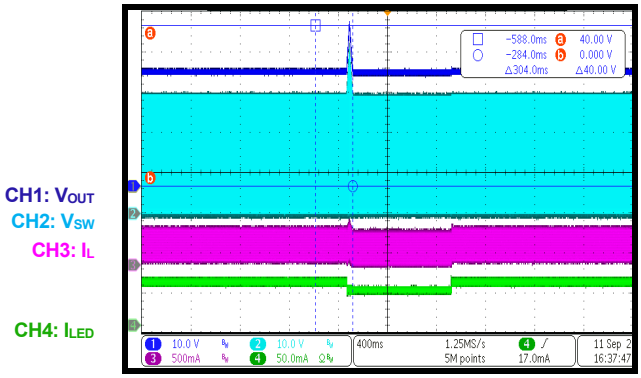


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN} = 7.6V, 10 LEDs in series, 6 strings, 20mA/string, L = 10µH, T_A = 25°C, unless otherwise noted.

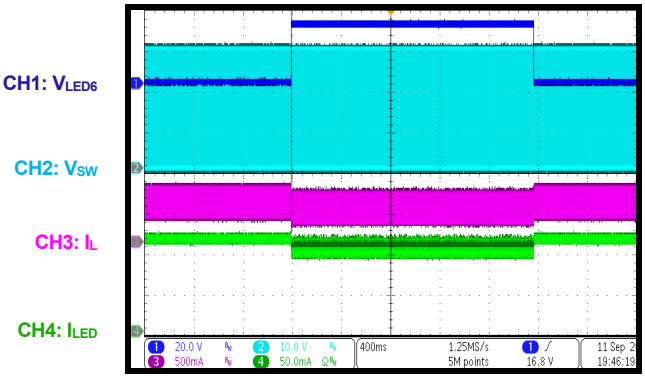
LED Open Protection

Duty = 50%, open one string, then recover

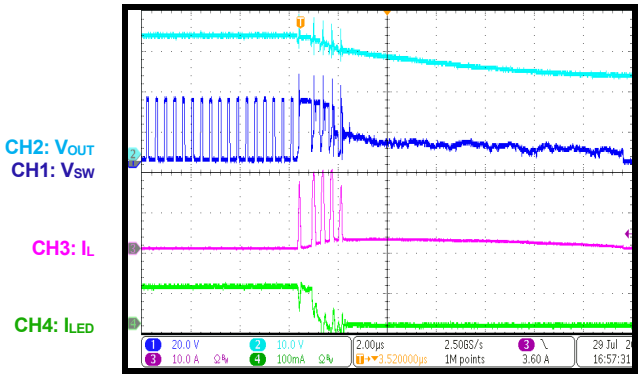


LED Short Protection

Short LED string 6, then recover

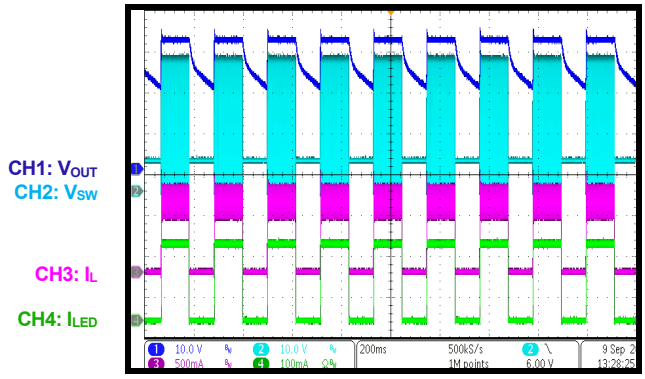


Diode Short Protection



Over-Temperature Protection

30mA/string, heat device



PCB LAYOUT

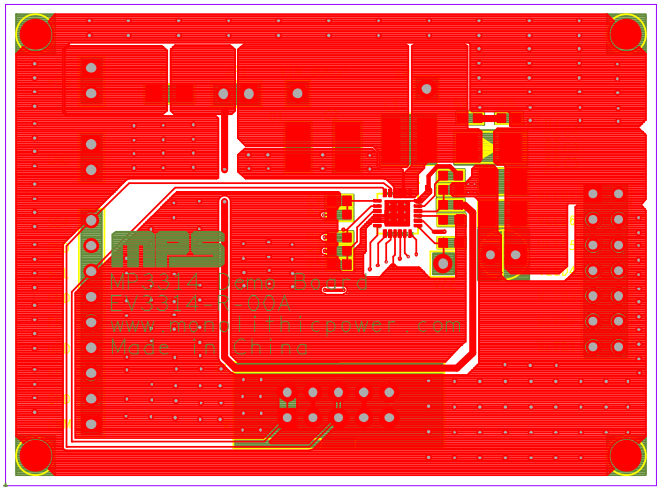


Figure 2: Top Layer

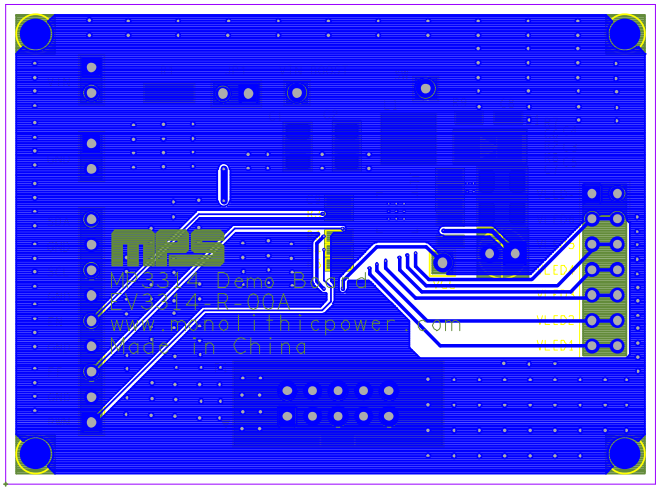


Figure 3: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	6/10/2022	Initial Release	-

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