EV3383-S-00A

4-String, Max 400mA/String, Max 80V V_{OUT}, Step-Up WLED Controller in a SOIC-16 Package Evaluation Board

DESCRIPTION

The EV3383-S-00A evaluation board is designed to demonstrate the capabilities of the MP3383, a step-up controller with four LED current channels, designed to drive WLED arrays for large-sized LCD panel backlighting applications. The MP3383 can expand the number of LED channels with two or more ICs in parallel sharing a single power source.

The MP3383 employs peak current control mode with a fixed switching frequency (f_{SW}) that is configurable via an external setting resistor. The MP3383 drives an external MOSFET to boost up the output voltage (V_{OUT}) from a 6V to 33V input voltage (V_{IN}) supply. It also regulates the current in each LED string to the value set by an external current-setting resistor.

The MP3383 applies four internal current sources for current balancing. The current matching achieves 1.8% regulation accuracy among strings. The low regulation voltage on the LED current sources reduces power loss.

The MP3383 supports direct pulse-width modulation (PWM) dimming as well as analog dimming using a PWM input. Full protection features include over-current protection (OCP), over-temperature protection (OTP), under-voltage protection (UVP), over-voltage protection (OVP), LED short and open protection, and inductor and diode short protection.

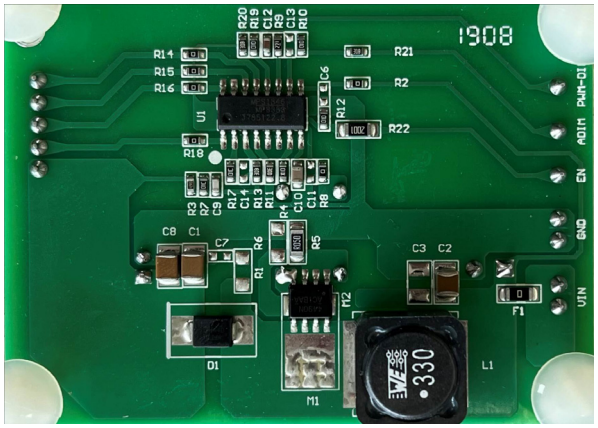
The MP3383 is available in SOIC-16 and TSSOP-16EP packages.

PERFORMANCE SUMMARY

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

Parameters	Conditions	Value
Input voltage (V_{IN}) range		6V to 33V
Output voltage (V_{OUT})		Max V_{OUT} < 80V
LED string		4 strings
Maximum LED current (I_{LED})	R_{ISET} = 3kΩ	400mA/channel

EV3383-S-00A EVALUATION BOARD



LxW (6.8cmx4.9cm)

Board Number	MPS IC Number
EV3383-S-00A	MP3383GS

QUICK START GUIDE

1. Preset the voltage source placed between the VIN and GND terminals to between 6V and 33V.
2. Connect the LED (4 strings) load terminals to:
   a. Positive (+): LED+ terminal
   b. Negative (-): LED1, LED2, LED3, and LED4 terminals
3. Apply a 5V voltage between the EN terminal and GND to enable the device.
4. For pulse-width modulation (PWM) dimming brightness control, apply a PWM signal between the PWM terminal and GND, then apply a 5V voltage between the ADIM terminal and GND.
5. For analog dimming brightness control, apply a PWM signal between the ADIM terminal and GND, then apply a 5V voltage between the PWM terminal and GND.

EVALUATION BOARD SCHEMATIC

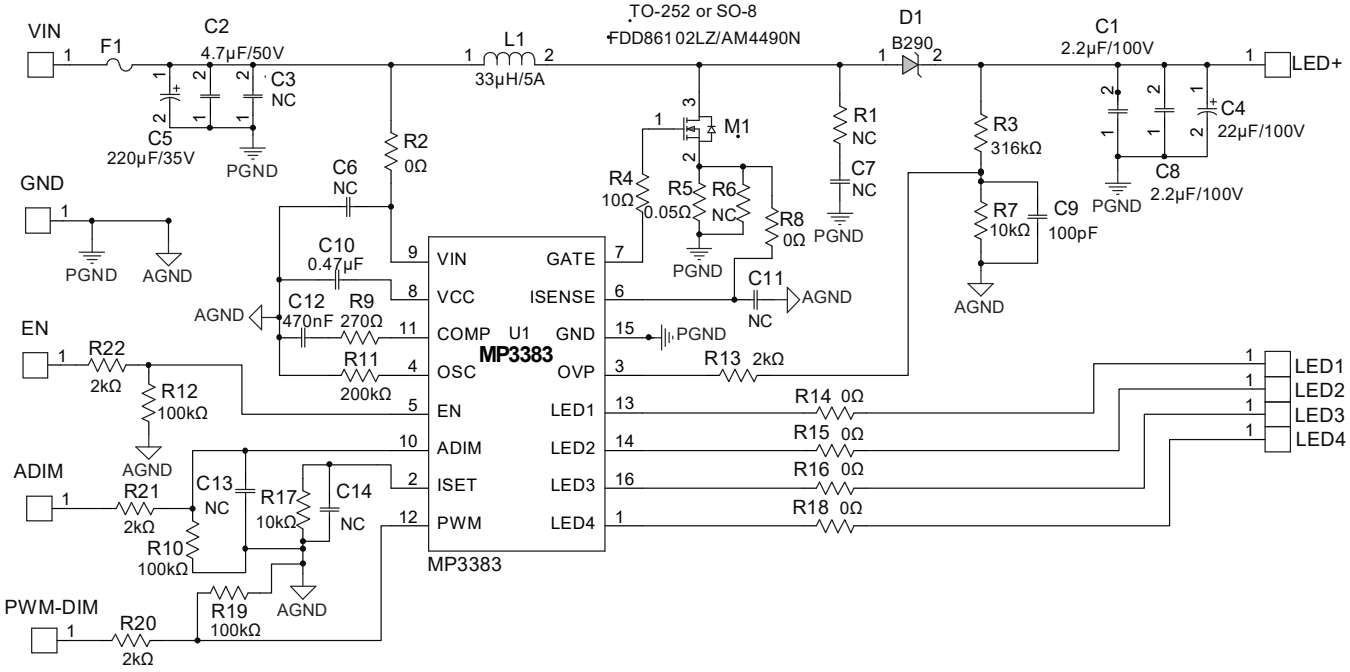


Figure 1: Evaluation Board Schematic

EV3383-S-00A BILL OF MATERIALS

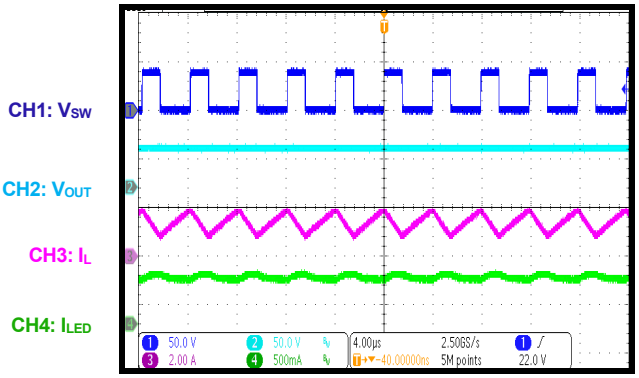
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
2	C1, C8	2.2µF	Ceramic capacitor, 100V, X7R	1210	Murata	GRM32ER72A225KA35L
1	C2	4.7µF	Ceramic capacitor, 50V, X7R	1210	Murata	GRM32ER71H475KA88L
1	C3	NC				
1	C4	22µF	Electrolytic capacitor, 100V	DIP	Jianghai	CD263-100V22
1	C5	220µF	Electrolytic Capacitor, 35V	DIP	Jianghai	CD110-35V220
5	C6, C7, C11, C13, C14	NC				
1	C9	100pF	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H101JA01D
1	C10	470nF	Ceramic capacitor, 16V, X7R	0805	Murata	GRM219R71C474KA01D
1	C12	470nF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM18R7C474KA88D
1	D1	2A	Schottky diode, 90V	SMB	Diodes, Inc	B290
2	F1	0Ω	Film resistor, 1%	1206	Yageo	RC1206FR-070RL
1	L1	33µH	Inductor, 4.2A, 45mΩ	SMD	Wurth	7447709330
1	M1	100V	N-channel MOSFET	SO-8	Analog Power	AM4490N
1	R1	NC				
6	R2, R8, R14, R15, R16, R18	0Ω	Film resistor, 1%	0603	Yageo	RC0603JR-070RL
1	R3	316kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07316KL
1	R4	10Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0710RL
1	R5	0.05Ω	Current resistor, 1%	1206	Yageo	RC1206FR-070R05L
1	R6	NC				
1	R7	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R9	270Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07270RL
3	R13, R20, R21	2kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-072KL
1	R11	200kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07200KL
3	R10, R12, R19	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R17	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R22	2kΩ	Film resistor, 1%	1206	Yageo	RC1206FR-072KL
10	EN, GND, LED, LED1, LED2, LED3, LED4, ADIM, PDIM, VIN	2.54mm	Connector, 90°	Custom	Custom	
2	JP1, JP2	0.4mm	Fly line	Custom	Custom	
1	U1	MP3383	4-string, max 80V V_{OUT}, step-up WLED controller	SOIC-16	MPS	MP3383GS-Z

EVB TEST RESULTS

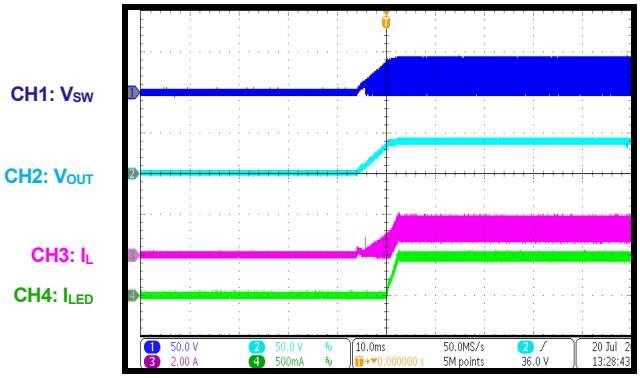
Performance waveforms are tested on the evaluation board, V_{IN} = 15V, V_{EN} = 5V, 120mA/string, 4 strings, 14 LEDs in series, T_A = 25°C, unless otherwise noted.

Steady State

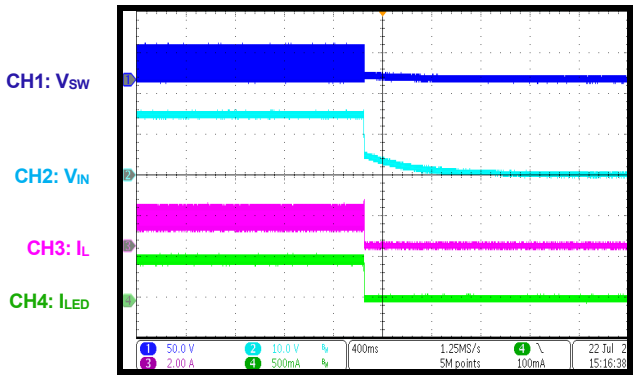
f_{SW} = 250kHz



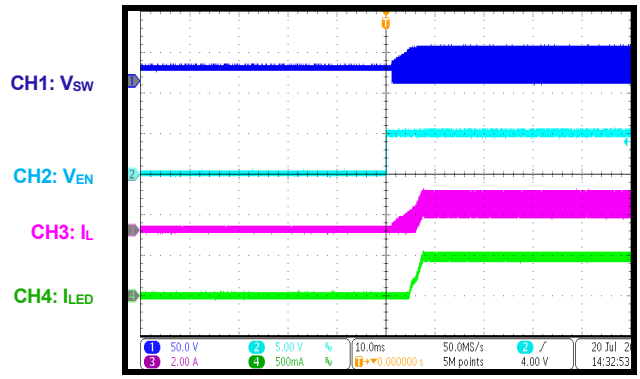
Start-Up through VIN



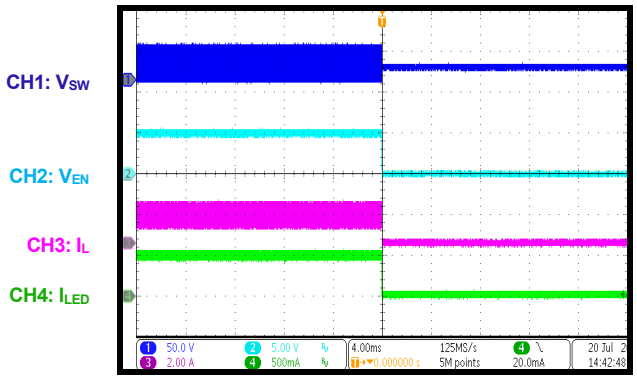
Shutdown through VIN



Start-Up through EN

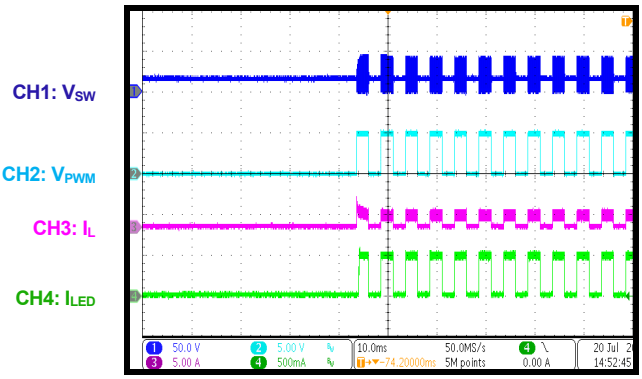


Shutdown through EN



Start-Up through PWM

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

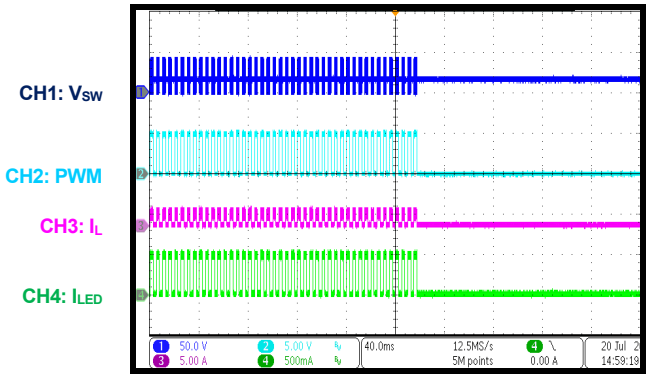


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN} = 15V, V_{EN} = 5V, 120mA/string, 4 strings, 14 LEDs in series, T_A = 25°C, unless otherwise noted.

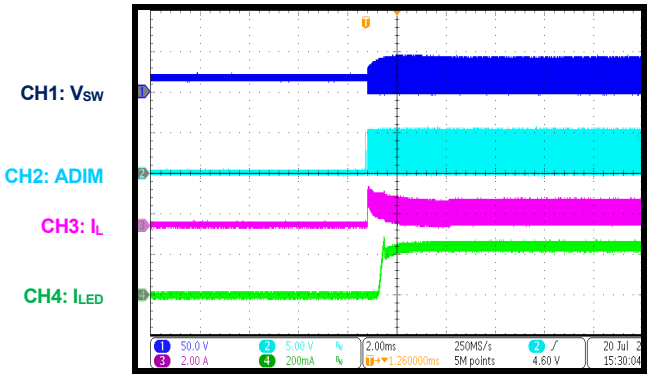
Shutdown through PWM

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



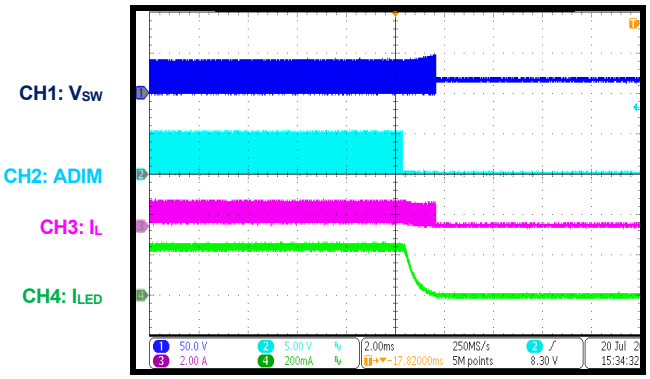
Start-Up through ADIM

f_{ADIM} = 20kHz, D_{ADIM} = 50%



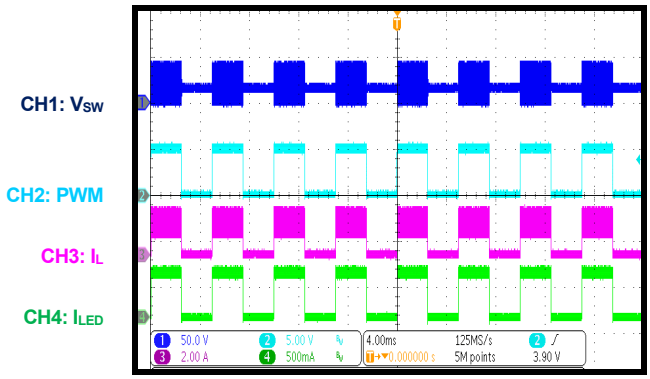
Shutdown through ADIM

f_{ADIM} = 20kHz, D_{ADIM} = 50%



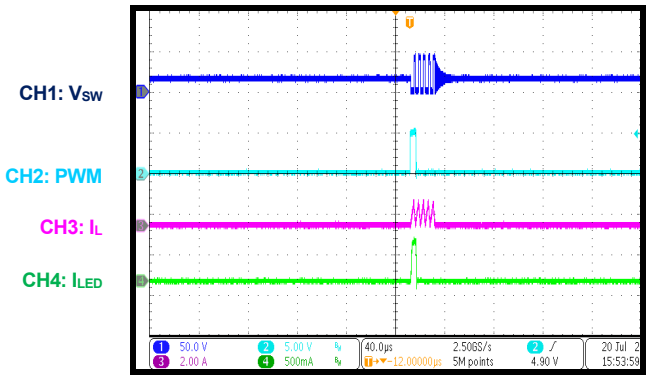
PWM Dimming

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



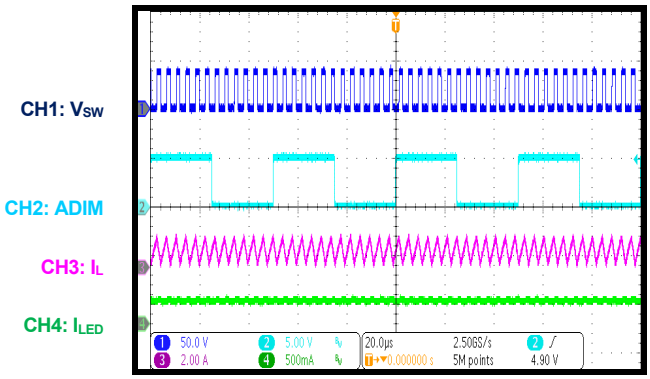
PWM Dimming

f_{PWM} = 200Hz, D_{PWM} = 0.1%



Analog Dimming

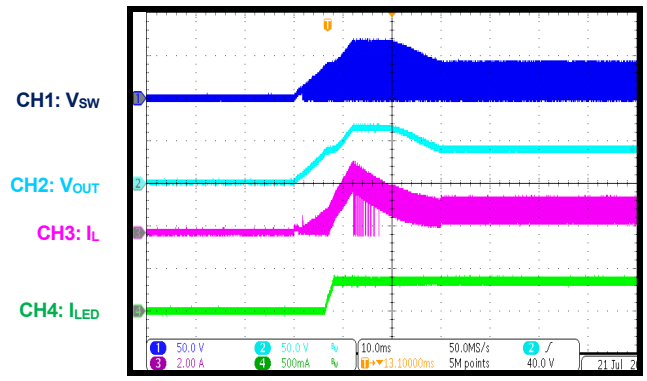
f_{ADIM} = 20kHz, D_{ADIM} = 50%



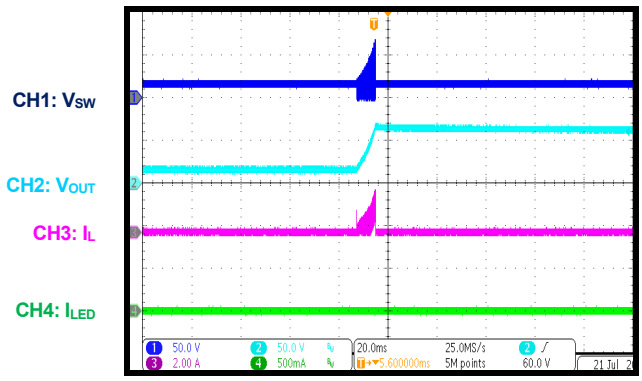
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN} = 15V, V_{EN} = 5V, 120mA/string, 4 strings, 14 LEDs in series, T_A = 25°C, unless otherwise noted.

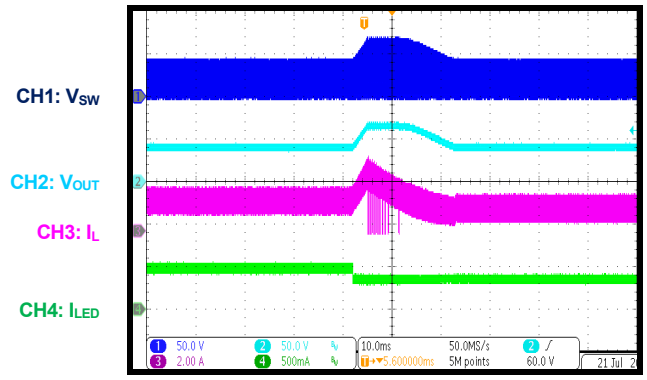
Start-Up with One String Open



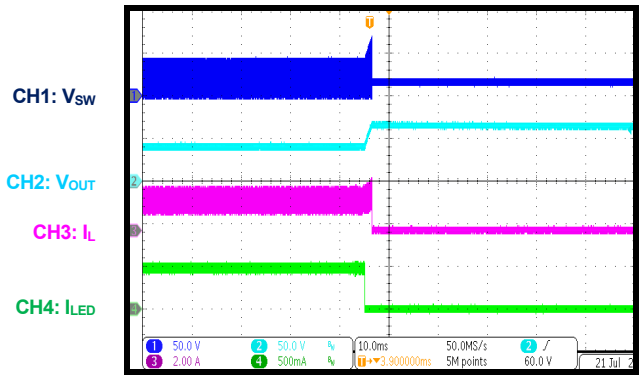
Start-Up with All Strings Open



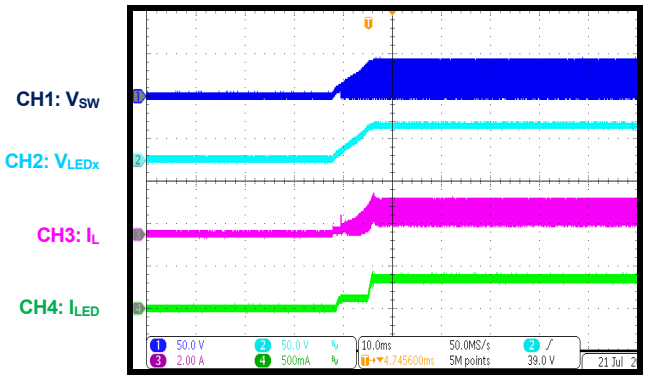
Open One String during Normal Operation



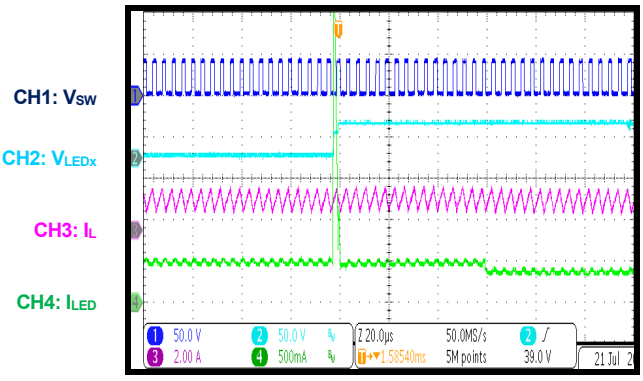
Open All Strings during Normal Operation



Start-Up with One-String Short



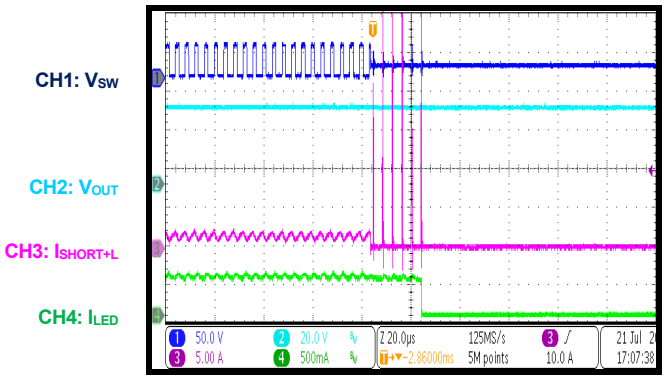
Short One String during Normal Operation



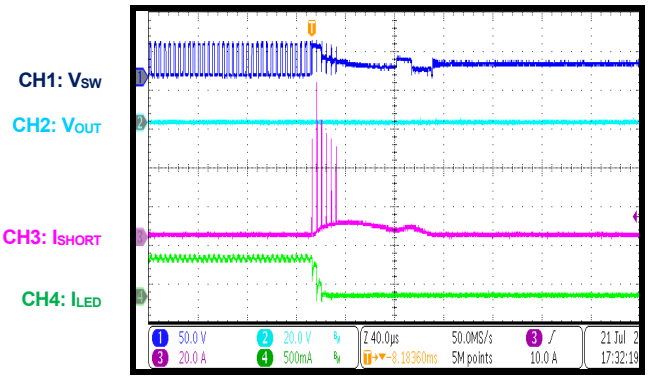
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN} = 15V, V_{EN} = 5V, 120mA/string, 4 strings, 14 LEDs in series, T_A = 25°C, unless otherwise noted.

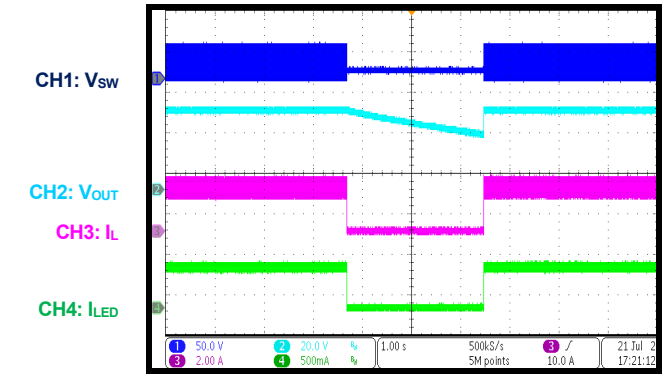
Short Inductor during Normal Operation



Short Diode during Normal Operation



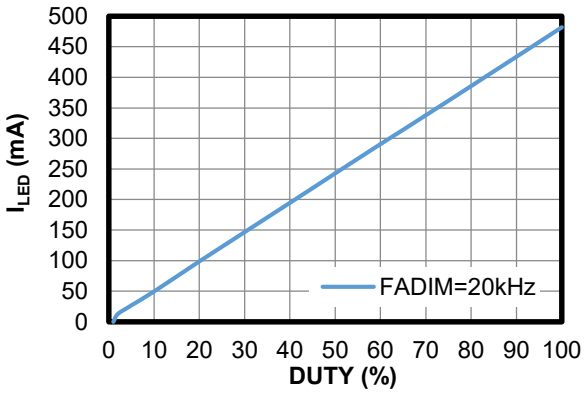
OTP and Recovery



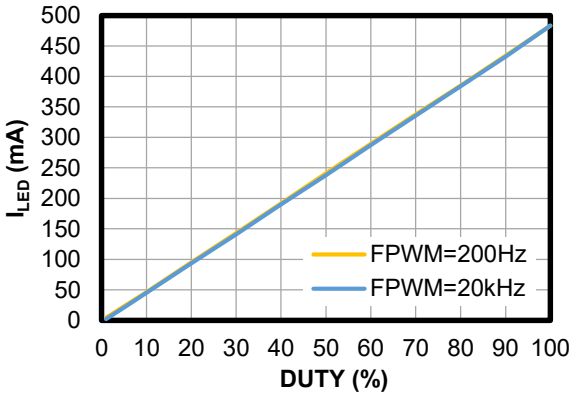
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN} = 15V, V_{EN} = 5V, 120mA/string, 4 strings, 14 LEDs in series, T_A = 25°C, unless otherwise noted.

Analog Dimming



PWM Dimming



PCB LAYOUT

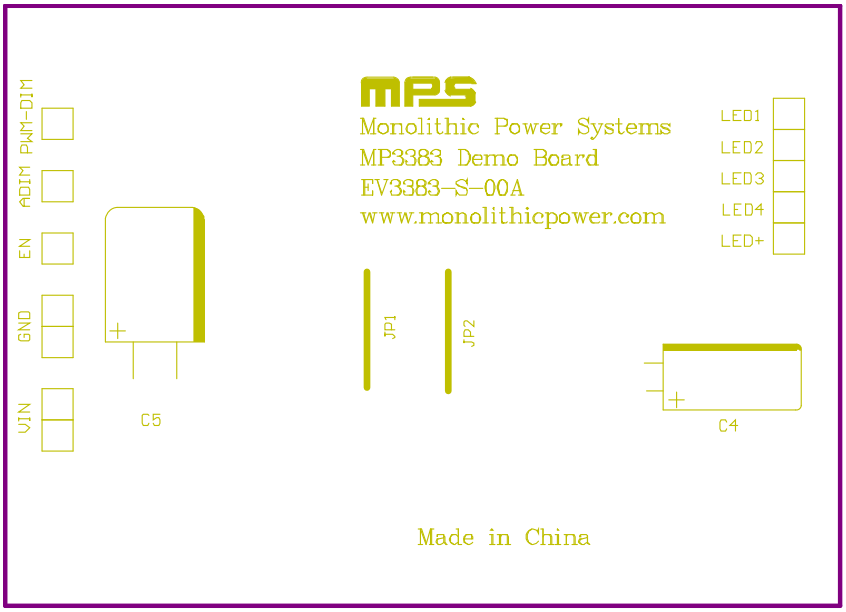


Figure 2: Top Layer

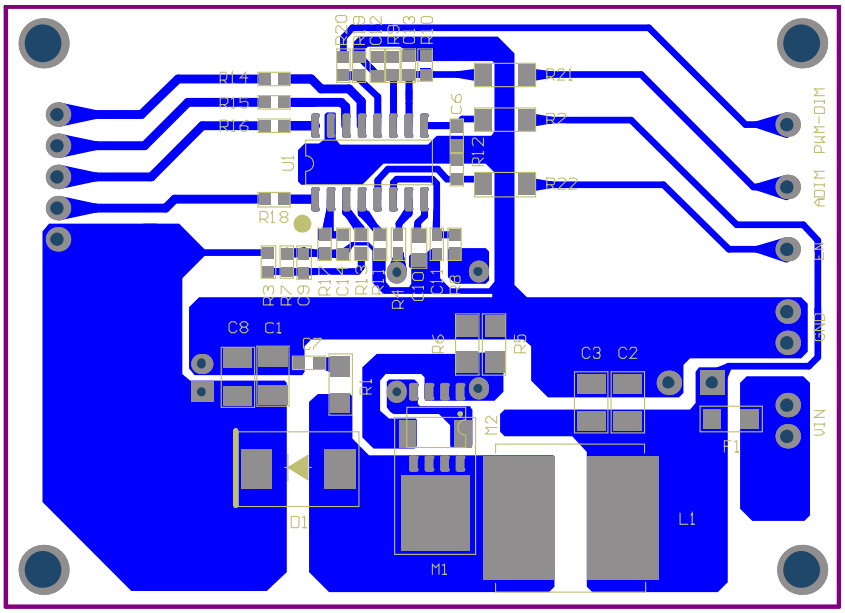


Figure 3: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	9/15/2022	Initial Release	-