EVQ7210-U-00A

60V, 2A, Synchronous Dual Buck LED Driver with SPI Interface Evaluation Board, AEC-Q100 Qualified

DESCRIPTION

The EVQ7210-U-00A is an evaluation board designed to demonstrate the capabilities of the MPQ7210, which is a synchronous, dual buck LED driver designed to operate as a constant current source. The MPQ7210 can drive two independent channels of LEDs. Each channel can support up to 2A of current, and the channels can also be connected in parallel to support up to 4A of current.

The MPQ7210's switching frequency (f_{SW}) can be set to 220kHz, 420kHz, 1.1MHz, or 2.3MHz via the one-time programmable (OTP) memory. A higher f_{SW} can be achieved by using a smaller-value inductor and capacitor, but leads to power loss and possible thermal issues. High-frequency operation can be selected for high LED current applications. The thermal and cooling conditions should be validated on the system level.

The 60V input voltage (V_{IN}) allows a string of up to 12 LEDs per channel to be connected in series. Pairing this device with a matrix manager such as the MPQ7241 can help create an ideal architecture for adaptive driving beams and matrix headlights.

Protection features include a failsafe (/FS) pin that reports if over-current protection (OCP) or under-voltage lockout (UVLO) occurs, as well as early thermal warning and thermal shutdown. These features can be used to assist the system in meeting functional safety requirements.

An integrated, 10-bit analog-to-digital converter (ADC) monitors V_{IN}, the output voltage (V_{OUT}), the internal bias supply voltage (V_{CC}), and junction temperature (T_J), and logs the data to the internal registers. These diagnostics can be read back by a microcontroller (MCU) via the SPI interface. The SPI interface can also be used to preset dimming profiles and mask undesired signals on the failsafe (/FS) pin.

The EVQ7210-U-00A is a fully assembled and tested, dual buck LED driver evaluation board. It generates an LED current (I_{LED}) up to 2A per channel from a 4.5V to 60V V_{IN} range.

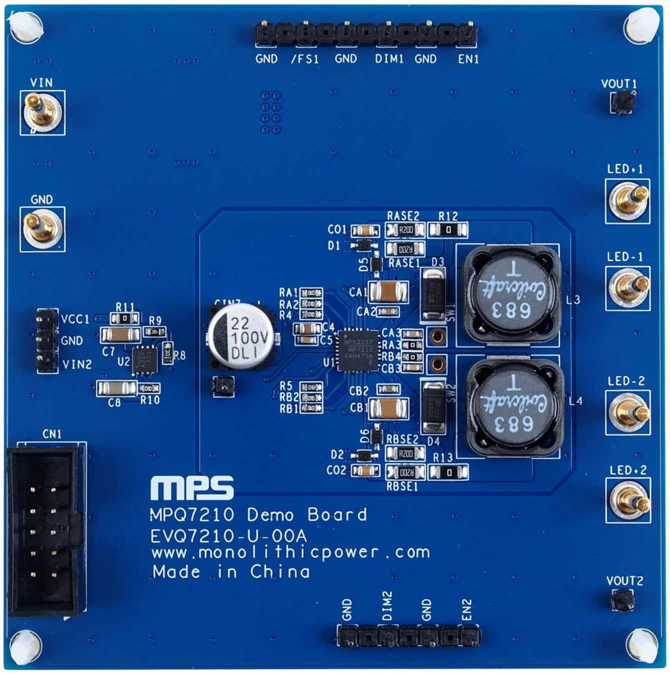
The MPQ7210 is available in a QFN-26 (5mmx5mm) package with wettable flanks, and is available in AEC-Q100 Grade 1.

PERFORMANCE SUMMARY

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

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4.5V to 60V
Maximum output current (I_{LED})	V_{IN} = 4.5V to 60V, f_{SW} = 420kHz	2A/channel
Typical efficiency	V_{IN} = 48V, f_{SW} = 420kHz, 12 LEDs, I_{LED} = 2A/channel	96.53%
Peak efficiency	V_{IN} = 42V, f_{SW} = 420kHz, 12 LEDs, I_{LED} = 1A/channel	97.42%
Switching frequency (f_{SW})		420kHz

EVALUATION BOARD



LxWxH (8.3cmx8.3cmx1.3cm)

Board Number	MPS IC Number
EVQ7210-U-00A	MPQ7210GUE-AEC1

QUICK START GUIDE

The EVQ7210-U-00A evaluation board can be used to evaluate the MPQ7210's performance. For proper measurement equipment set-up, refer to Figure 17 on page 12 and follow the steps below:

1. Preset the power supply between 4.5V and 60V, then turn off the power supply.
2. If longer cables (>0.5m total) are being used between the source and the evaluation board, install a damping capacitor at the input terminals. This is critical when V_{EMI} exceeds 24V.
3. Connect the power supply terminals to:
    a. Positive (+): VIN
    b. Negative (-): GND
4. Connect the load terminals to:
    a. Positive (+): LED+1 and LED-1
    b. Negative (-): LED+2 and LED-2
5. Ensure that the LED load can hold >2A current. If the evaluation board has an LED load, it is recommended to cover the LEDs with shielding to protect the user's eyes.
6. Preset another adjustable power supply to 12V, then turn off that power supply. Connect this second power supply to the EVQ7210-U-00A's VIN2 and GND pins; VIN2 is the MPQ2013A linear regulator's input, which generates 5V to supply the MPQ7210's internal circuits through VCC pin.
7. After making the connections, turn on VIN2 and VIN in sequence. The EVQ7210-U-00A should start up automatically; the LEDs should be on after the board starts up.
8. To use the graphic user interface (GUI), connect a communication interface to the CN1 pin using the ribbon cable provided with the communication interface (see Figure 1). (1) If the ribbon cable is too long, SPI communication may fail.

Note:

1) Contact an MPS FAE for the communication interface part number.

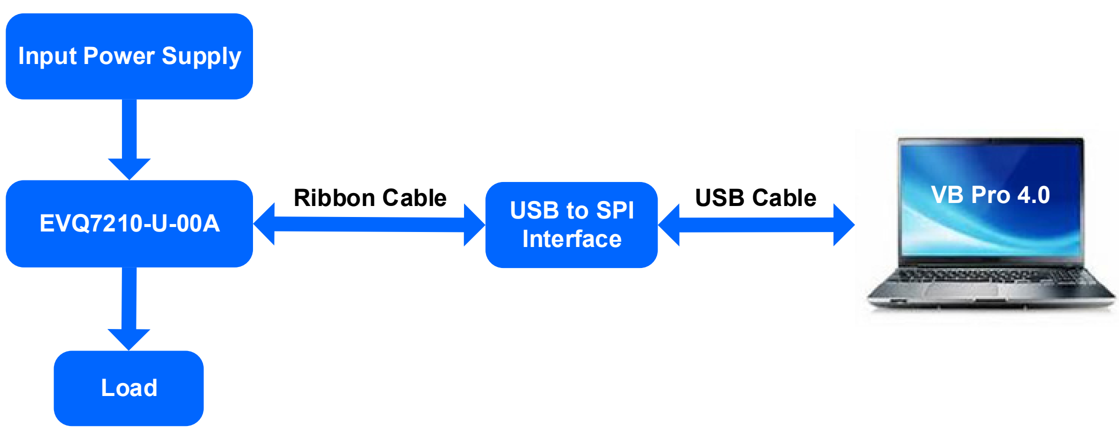


Figure 1: Communicate Kit Connection Diagram

9. Download the Virtual Bench Pro 4.0 GUI from the MPS website, then install the GUI.
10. Open the .exe file.
11. Go to "Create New Project" and enter the license number. Users can obtain the license code and key using the steps below, or by contacting an MPS FAE.

a. To request a license, go to the “Help” tab, select “License,” then click “Request a license” (see Figure 2).

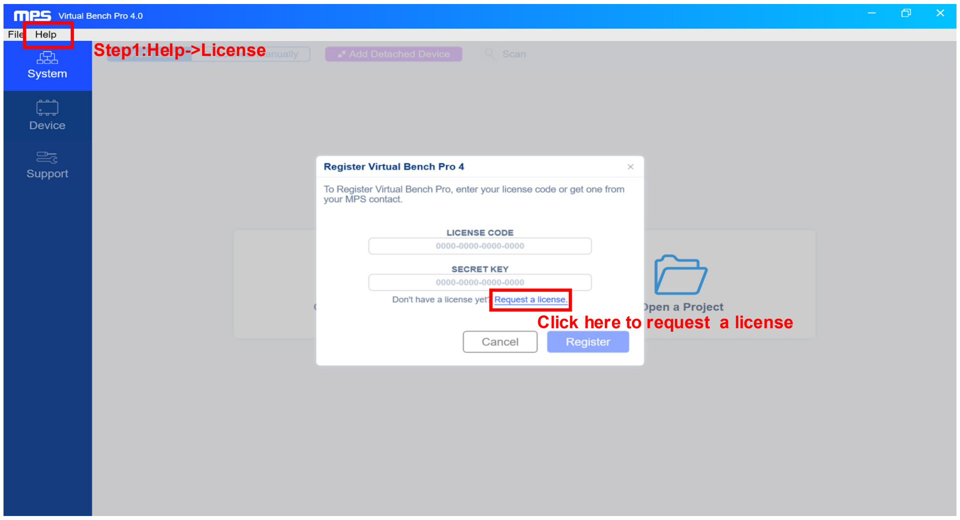


Figure 2: Requesting a License in Virtual Bench Pro 4.0

b. Fill in all relevant information in the license request form by following the link to the MPS website (Figure 3). An MPS FAE should approve the request within 3 business days.

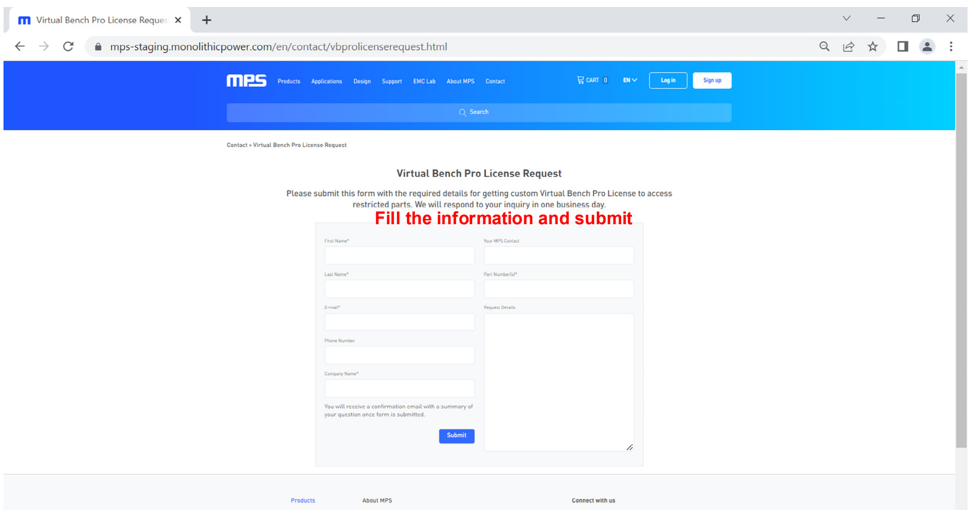


Figure 3: Filling Out the License Request Form

c. Once a license and key have been obtained, to start a new project, click “Create New Project,” then click “Add Manually” (see Figure 4 on page 5).

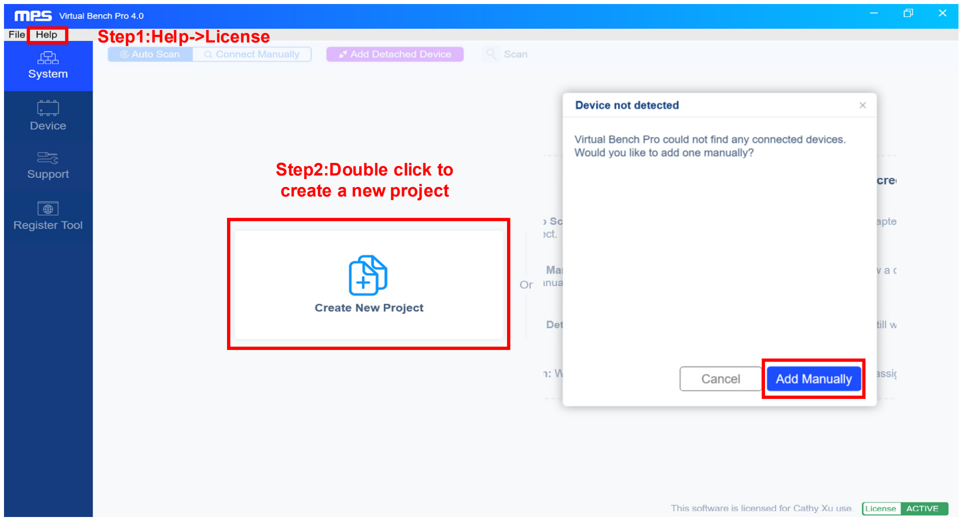


Figure 4: Creating a New Project in Virtual Bench Pro 4.0, Steps 1 and 2

d. Manually connect to Virtual Bench 4.0 (see Figure 5).

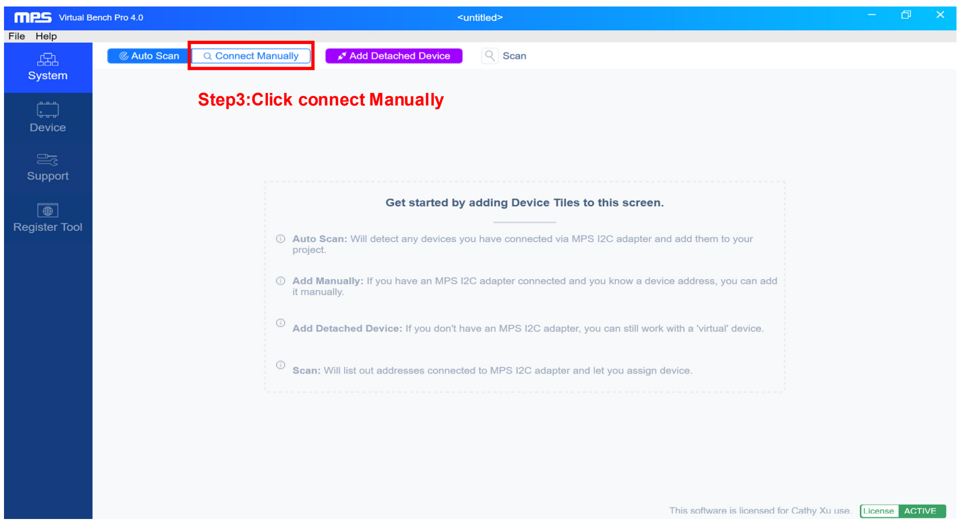


Figure 5: Creating a New Project in Virtual Bench Pro 4.0, Step 3

12. Select the device by finding the MPQ7210, then click “Next” (see Figure 6 on page 6).

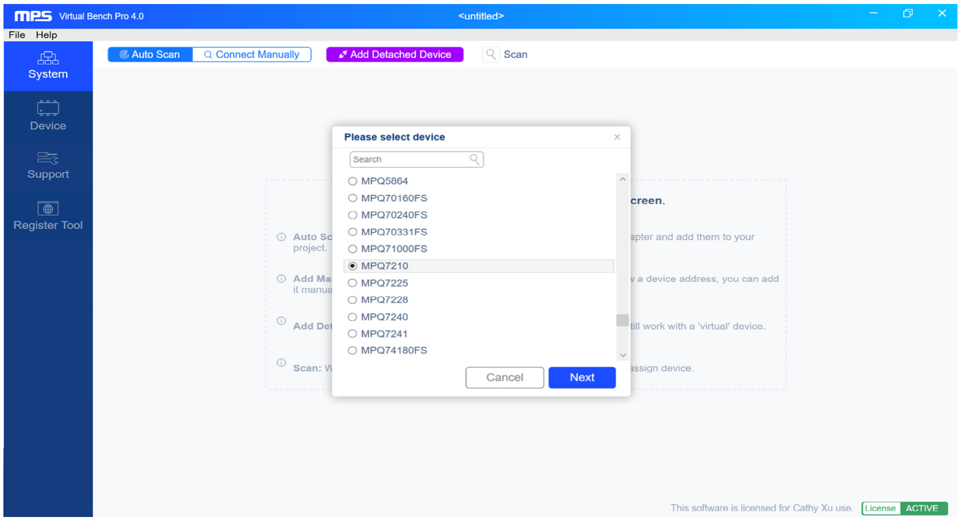


Figure 6: Select the MPQ7210 in Virtual Bench Pro 4.0

13. Select “SPI,” then click “OK” (see Figure 7).

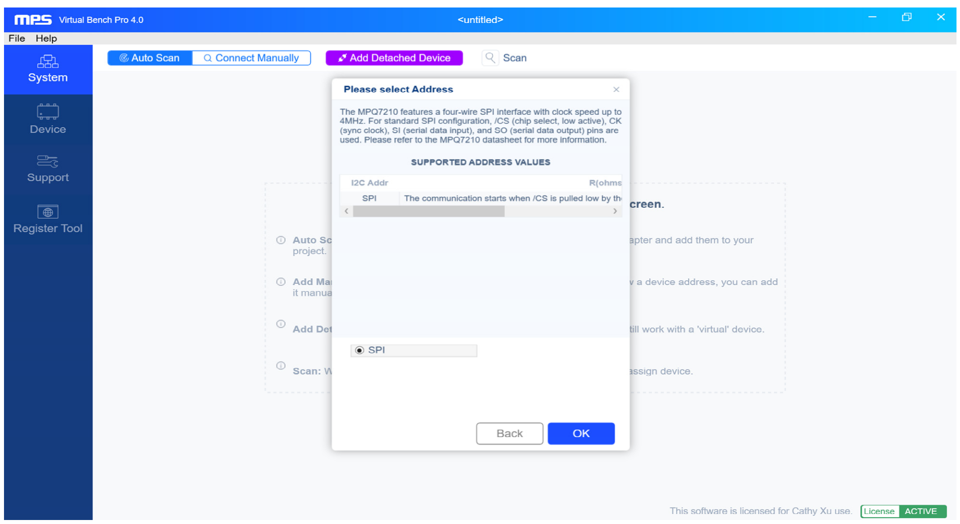


Figure 7: Select SPI in Virtual Bench Pro 4.0

14. Double-click the MPQ7210 window (see Figure 8 on page 7).

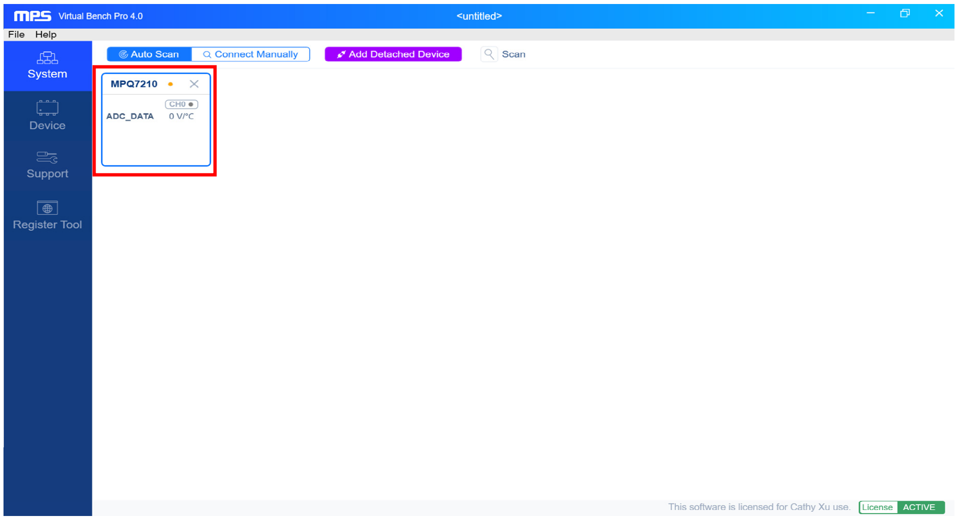


Figure 8: Selecting the MPQ7210 in Virtual Bench Pro 4.0

15. Turn on VIN2 and the 12V power supply sequentially, then control MPQ7210 via Virtual Bench Pro 4.0. When the indicator toward the top of the window (see (a) in Figure 9) turns green, this means that the USB is connected. When indicator toward the right side of the window (see (B) in Figure 9) turns green, this means that the communication interface is connected to the EVQ7210-U-00A. Once all connections have been made, the registers can be read and written using the “Read” and “Write” buttons (see Figure 9).

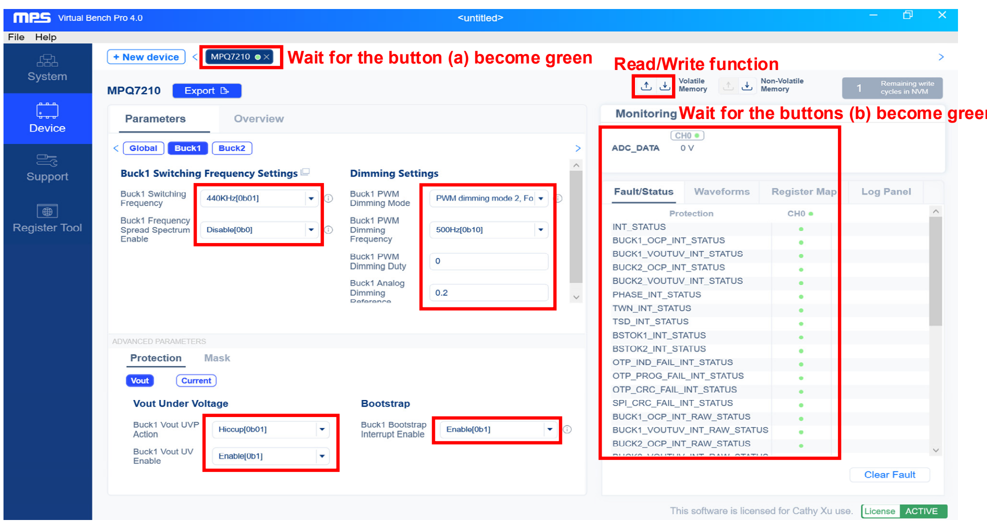


Figure 9: Read and Write in Virtual Bench Pro 4.0

For more details on using Virtual Bench Pro 4.0, contact an MPS FAE.

16. Table 1 on page 8 shows the MPQ7210-0000’s register map.

Table 1: MPQ7210-0000 Register Map

Register Name	R/W	Address	Default Value
SIL_INF	R/W	0x01	0000
DEV_CFG	R/W	0x03	005A
PWM_DIM1	R/W	0x04	0000
PWM_DIM2	R/W	0x05	0000
ANA_DIM1	R/W	0x06	00C8
ANA_DIM2	R/W	0x07	00C8
INT_ALL	R	0x08	0000
/FS_CFG	R/W	0x09	5551
/FS_INT_STATUS	R/W1C (2)	0x0A	0000
/FS_INT_RAW_STATUS	R	0x0B	0000
/FS_ INT _EN	R/W	0x0C	93FC
/FS_INT_MASK_EN	R	0x0D	0000
/FS_INT__REAL_TIME_STATUS	R	0x0E	0000
BUCK1_CFG	R	0x10	0016
BUCK2_CFG	R	0x11	0016
ADC_CTRL	R/W	0x12	0000
ADC_OUT	R	0x13	0000
BUCK_STATUS	R	0x15	0000
BUCK_EN	R/W	0x20	0000

Note:

2) “W1C” means writing 1 to this register clears the fault flag.

Refer to the MPQ7210 datasheet for more details regarding register configuration.

17. To use the enable (EN) function via the ENx pins, apply a digital input to the EN1/EN2 pins. Drive EN1 and EN2 above 1V to turn buck 1 and buck 2 on, respectively. Pull EN1 and EN2 below 0.85V to turn buck 1 and buck 2 off, respectively.

    The MPQ7210 also can be enabled or disabled by pulling EN1/2 high and configuring the BUCK_EN register (0x20) as follows:

    a. If the BUCK_EN1 bit = 0, buck 1 is enabled. If this bit = 1, buck 1 is disabled.

    b. If the BUCK_EN2 bit = 0, buck 2 is enabled. If this = 2, buck 2 is disabled.

18. To use the pulse-width modulation (PWM) dimming function, the PWM dimming mode can be configured via the DEV_CFG register (0x03). There are three dimming modes (see Table 2).

Table 2: PWM Dimming Modes

PWM Dimming Mode	Description
PWM dimming mode 1	Drive the DIM1/2 pins above 2V for buck 1 and buck 2 to use PWM dimming with a set dimming frequency and duty, configured by the SPI interface. Drive DIM1/2 below 0.8V for buck 1 and buck 2 to stop switching.
PWM dimming mode 2	Apply an 100Hz to 2kHz external clock to the DIM1/2 pins for PWM dimming mode 2.
PWM dimming mode 3	Drive the DIM1/2 pins above 2V for buck 1 and buck 2 to work at 100% dimming duty. Drive DIM1/DIM2 below 0.8V for buck 1 and buck 2 to works at a set dimming duty and frequency, as configured by the SPI interface.

For detailed information regarding PWM dimming mode configuration, refer to the MPQ7210 datasheet.

19. Set the LED current (I_{LED1}/I_{LED2}) for buck 1 and 2, respectively, using the external resistor connected between the ISP1/ISP2 and ISN1/ISN2 pins, respectively. The LED current (I_{LEDx}) can be calculated with Equation (1):

$$I_{LEDx}(A) = \frac{0.2V}{R(\Omega)} \tag{1}$$

    The reference voltage (0.2V) can also be adjusted via the SPI interface by changing the ANA_DIM1/2 registers (0x06 and 0x07, respectively). The reference voltage can be adjusted from 10mV to 255mV.

20. To use the one-time-programmable (OTP) memory, which is integrated into Virtual Bench Pro 4.0, follow the steps below:

    a. Ensure that the power on the board's VIN pin is 12V, then disconnect VIN2.

    b. Apply an adjustable power supply to the VCC pin, and preset it to 5V.

    c. Ensure that the GUI can communicate with the EVQ7210-U-00A so that the read and write registers are correct (see Figure 10).

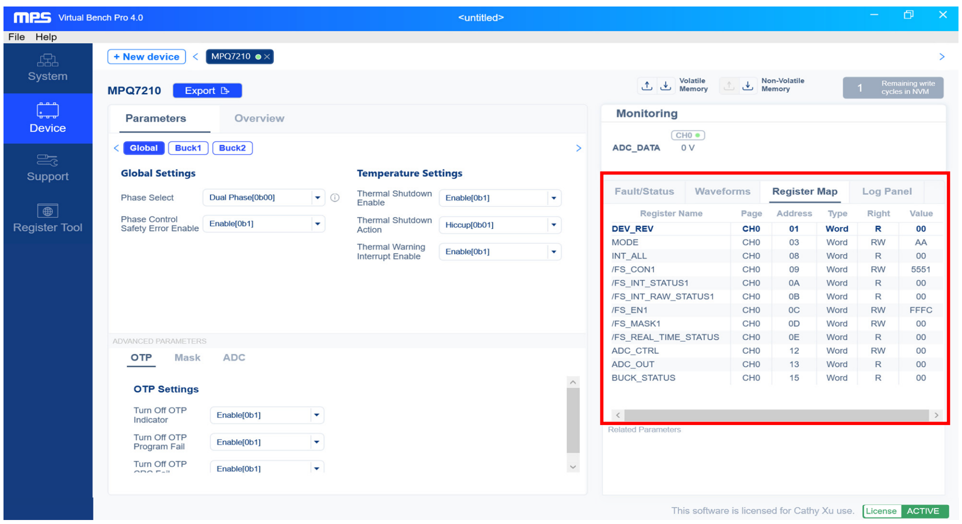


Figure 10: Register Map in Virtual Bench Pro 4.0

    d. Many parameters (e.g. f_{SW}, PWM dimming setting, protections, and mask settings) can be configured via the GUI. After writing to the register(s), check the register map to ensure that the target register value(s) are displayed.

    e. Once the register values have been changed, click the "OTP" button to start the OTP process (see Figure 11 on page 10).

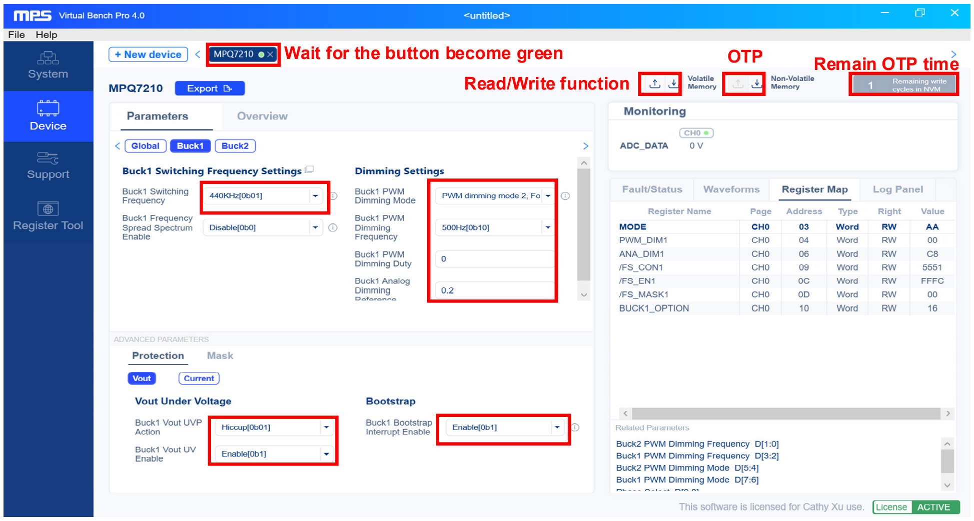


Figure 11: The OTP Process in Virtual Bench Pro 4.0

f. The user may receive certain reminders to complete the process. Figure 12 shows a reminder to adjust the external VDD power supply to 6.7V. (VDD in Virtual Bench Pro 4.0 represents the VCC voltage (V_{CC}).)

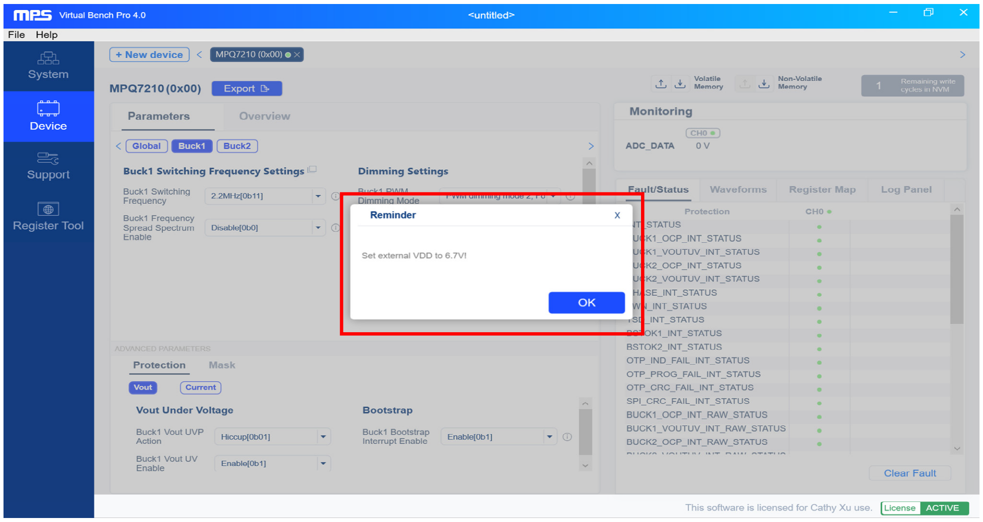


Figure 12: Reminder to Set VDD to 6.7V in Virtual Bench Pro 4.0

Figure 13 shows a reminder to adjust the external VDD to 5V. (VDD in Virtual Bench Pro 4.0 represents V_{CC}.)

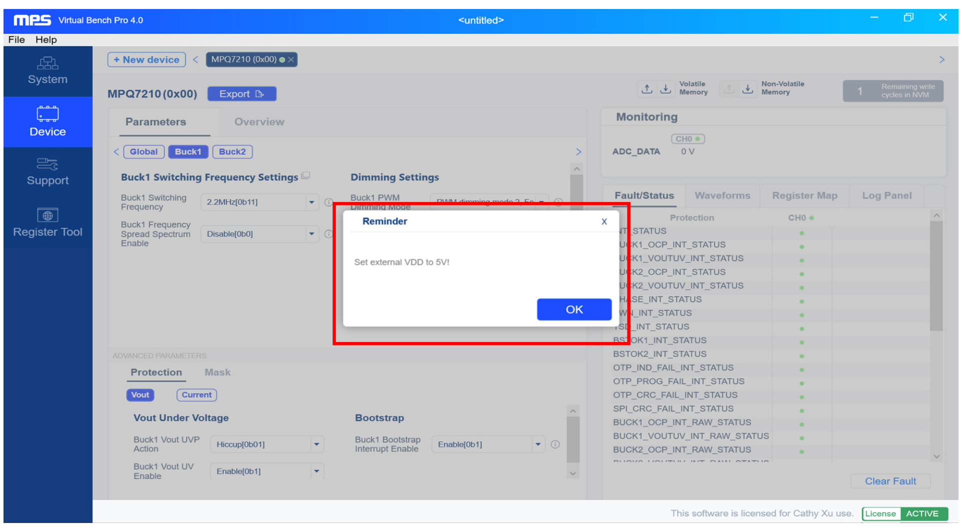


Figure 13: Reminder to Set VDD to 5V in Virtual Bench Pro 4.0

Figure 14 on page 12 shows a reminder for power-on reset (POR).

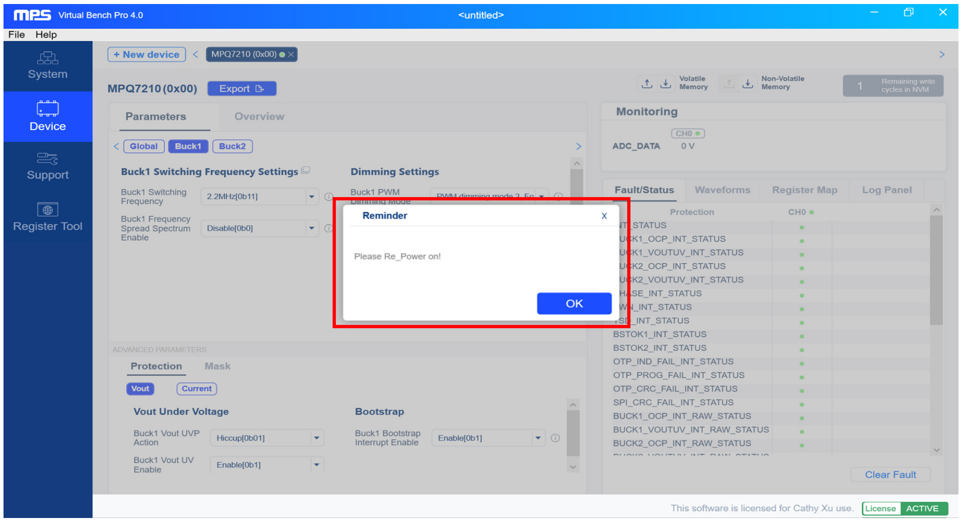


Figure 14: Power-On Reset Reminder in Virtual Bench Pro 4.0

g. Reset the MPQ7210 to ensure that the new OTP values are valid.

   If the remaining OTP time is 0, this means the MPQ7210 has already been configured once, and cannot be configured again. The default version of the MPQ7210 ()MPQ7210-0000) is not programmed.

h. The MPQ7210 can be configured through a configuration file. To do this, import the ATE file and repeat steps a–g above (see Figure 15).

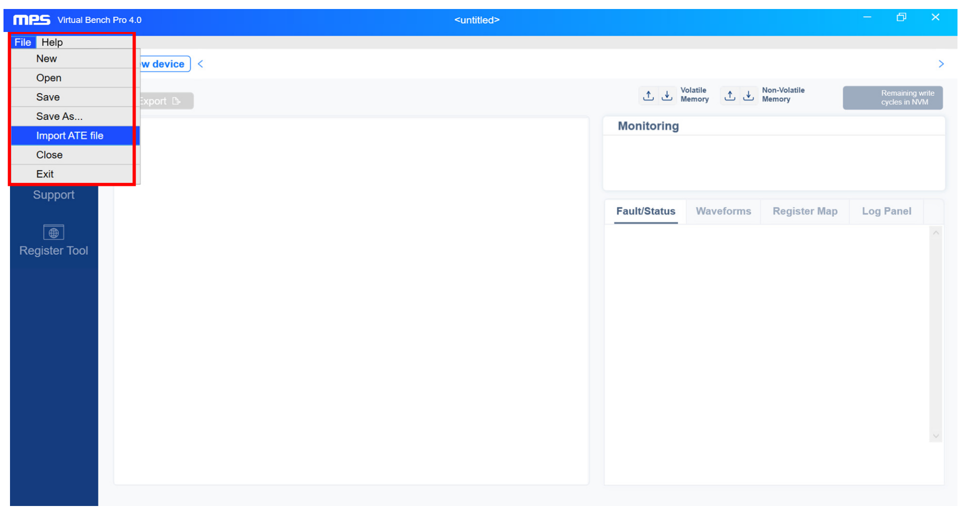


Figure 15: Import ATE File in Virtual Bench Pro 4.0

i. Obtain a configuration file from an MPS FAE (see Figure 16).

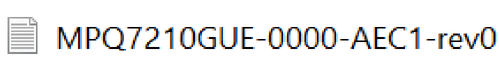


Figure 16: Configuration File

Figure 17 shows the measurement equipment set-up.

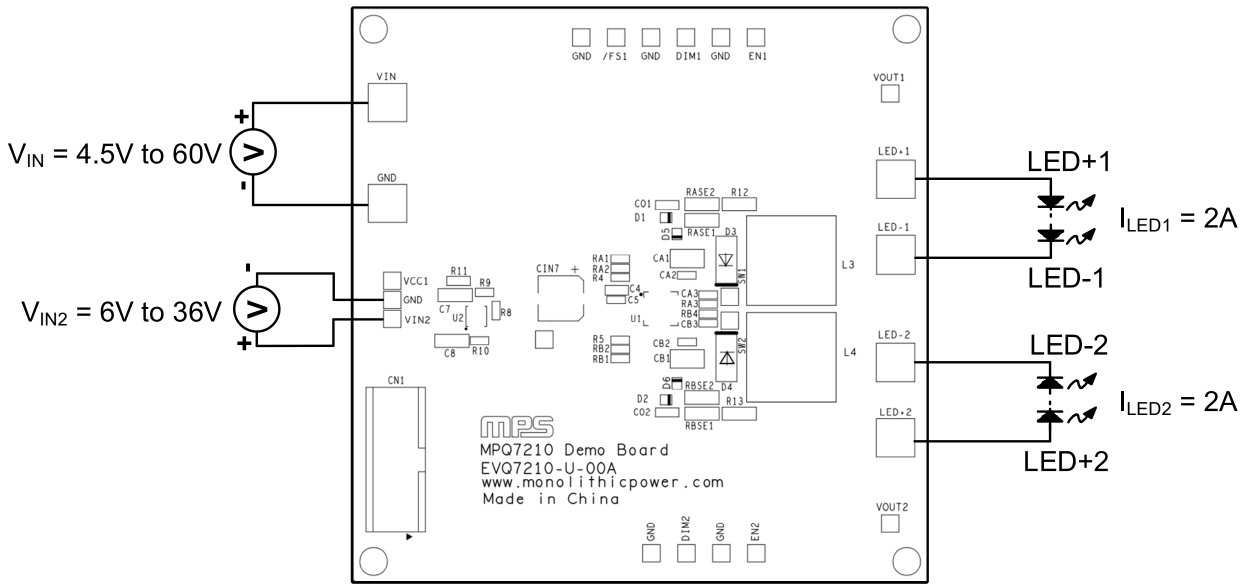


Figure 17: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

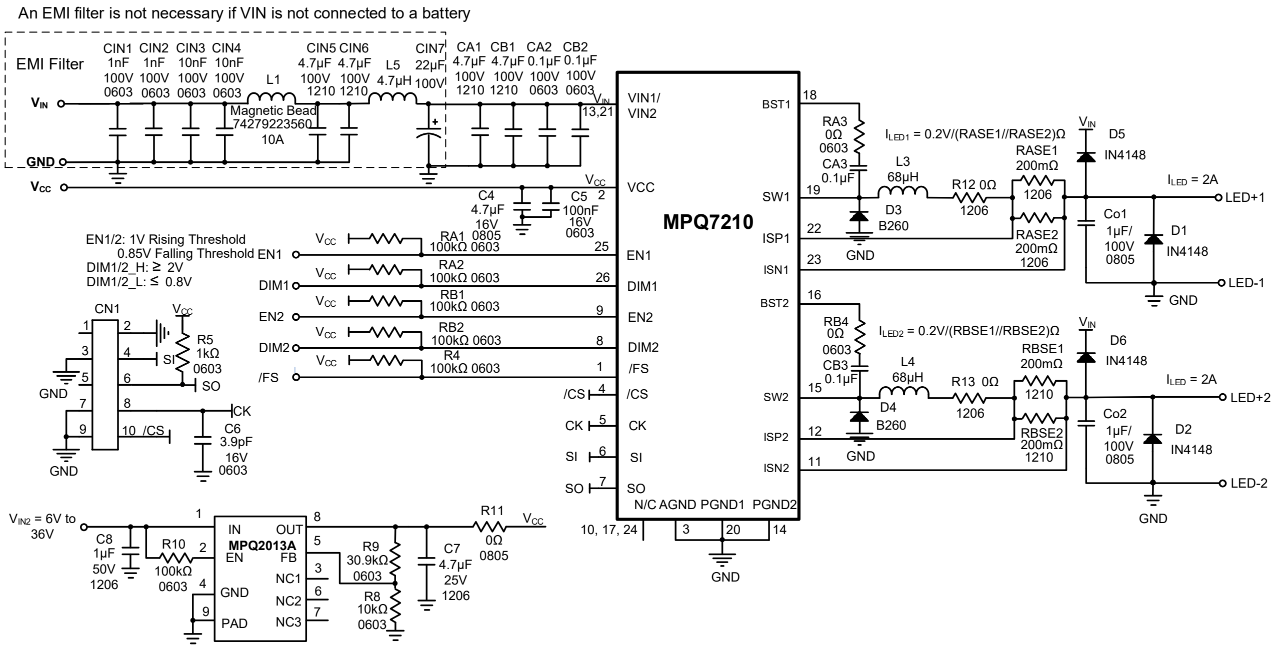


Figure 18: Evaluation Board Schematic

EVQ7210-U-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
11	VCC1, EN1, DIM1, EN2, DIM2, /FS1, GND	2.54mm	Test pin	DIP	Custom [(3)]	
4	CA1, CB1, CIN5, CIN6	4.7µF	Ceramic capacitor, 100V, X8L	1210	Murata	GCM32DL8EL475KE07L
2	CA2, CB2	100nF	Ceramic capacitor, 100V, X7R	0603	Murata	GCJ188L8EL104KA07
3	CA3, CB3, C5	100nF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM188R71C104KA01D
2	CIN1, CIN2	1nF	Ceramic capacitor, 100V, X7R	0603	Murata	GRM188R72A102KA01D
2	CIN3, CIN4	10nF	Ceramic capacitor, 100V, X7R	0603	Murata	GRM188R72A103KA01D
1	CIN7	22µF	Electrolytic capacitor, 100V	SMD	Panasonic	VTD-100V22
1	CN1	2.54mm	Test pin, 5 rows and 2 columns	DIP	Custom [(3)]	
2	Co1,Co2	1µF	Ceramic capacitor, 100V, X7R	0805	TDK	C2012X7S2A105KT000N
1	C4	4.7µF	Ceramic capacitor, 16V, X7R	0805	Murata	GCM21BR71C475KA73L
1	C6	3pF	Ceramic capacitor, 16V, X7R	0603	Murata	GCM21BR71C475KA73L
4	D1, D2, D5, D6	300mA	Diode, 75V	SOD-323-2	Diodes, Inc.	1N4148WS-7-F
2	D3, D4	2A	Diode, 60V	SMA	Diodes, Inc.	B260A-13-F
6	VIN, GND, LED-1, LED+1, LED-2, LED+2	2mm	Golden pin	DIP	Custom [(3)]	
1	L1	10A	Magnetic bead	1612	Wurth	74279223560
2	L3, L4	68µH	Inductor, 94.5mΩ, 3A	SMD	Coilcraft	MSS1260T-683MLB
1	L5	4.7µH	Inductor, 40.1mΩ, 4.6A	SMD	Coilcraft	XAL4030-472MEB
4	RBSE1, RASE1, RBSE2, RASE2	200mΩ	Film resistor, 1%	1206	Yageo	RL1206FR-070R2L
2	R12, R13	0Ω	Film resistor, 1%	1206	Yageo	RC1206FR-070RL
2	RA3, RB4	0Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
6	R4, R10, RB1, RA1, RB2, RA2,	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R5	1kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071KL

EVQ7210-U-00A BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	R8	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R9	30.9kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0730K9L
1	R11	0Ω	Film resistor, 1%	0805	Yageo	RC0805FR-070RL
1	C7	4.7μF	Ceramic capacitor, 25V, X7R	1206	Murata	GCM31CR71E475KA55L
1	C8	1μF/50V	Ceramic capacitor, 50V, X7R	1206	Wurth	885012208093
1	U2	MPQ2013A	40V, 150mA, low quiescent current linear regulator	QFN-8 (3mmx3mm)	MPS	MPQ2013AGQ-AEC1
1	U1	MPQ7210	60V, 2A, dual buck LED driver	QFN-26 (5mmx5mm)	MPS	MPQ7210GUE-0000-AEC1

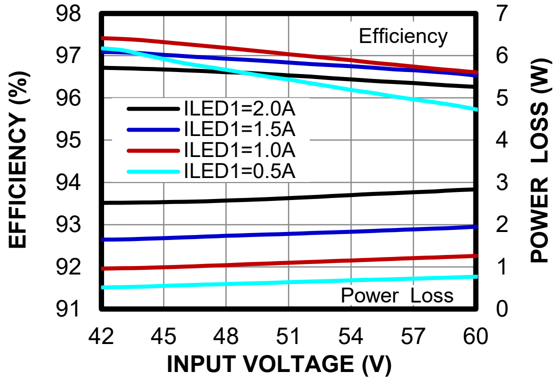
Note:

3) MPS custom-produces these pins. Contact MPS website for more information.

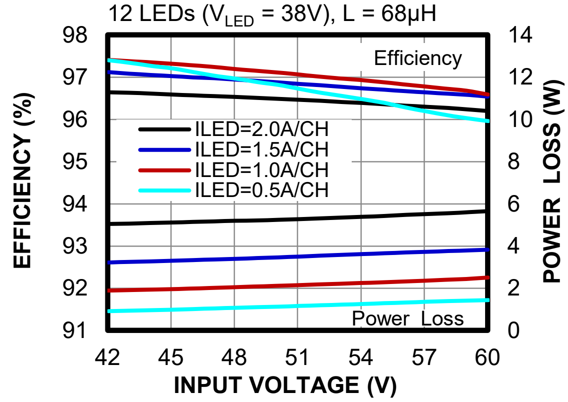
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68μH, T_A = 25°C, unless otherwise noted. (4)

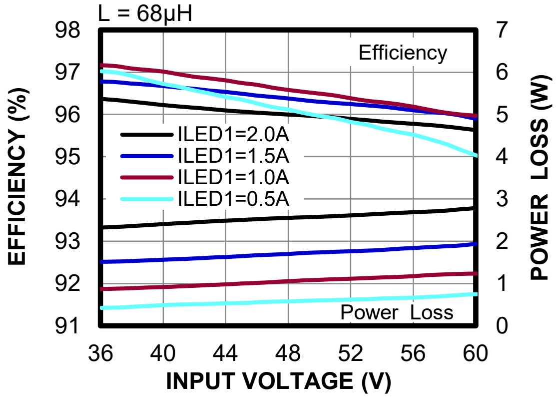
Efficiency vs. Input Voltage
Buck 1 only, 12 LEDs (V_{LED} = 38V), L = 68μH



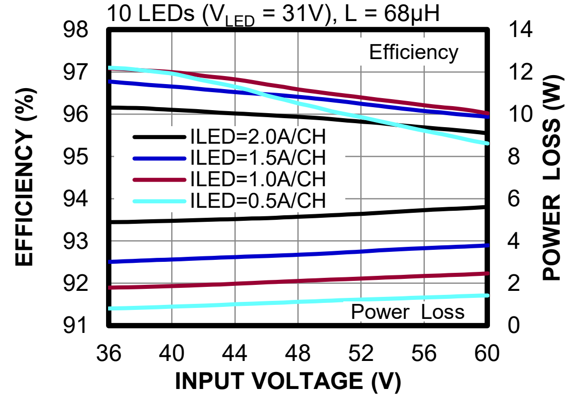
Efficiency vs. Input Voltage
Buck 1 and buck 2, 12 LEDs (V_{LED} = 38V), L = 68μH



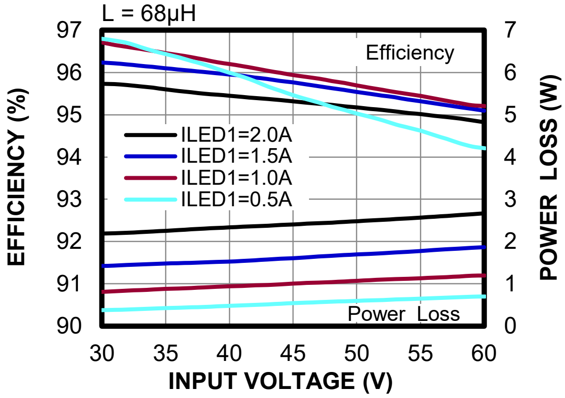
Efficiency vs. Input Voltage vs. Power Loss
Buck 1 only, 10 LEDs (V_{LED} = 31V), L = 68μH



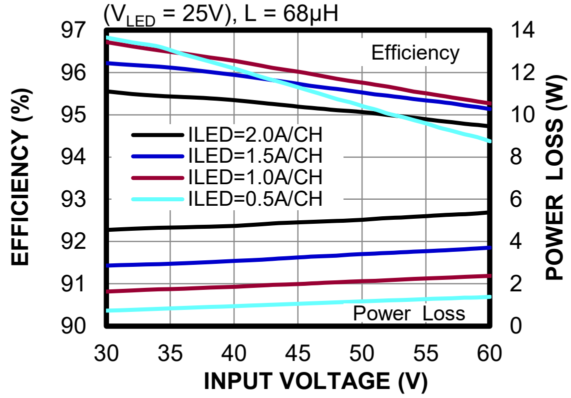
Efficiency vs. Input Voltage vs. Power Loss
Buck 1 and buck 2, 10 LEDs (V_{LED} = 31V), L = 68μH



Efficiency vs. Input Voltage vs. Power Loss
Buck 1 only, 8 LEDs (V_{LED} = 25V), L = 68μH



Efficiency vs. Input Voltage vs. Power Loss
Buck 1 and buck 2, 8 LEDs (V_{LED} = 25V), L = 68μH

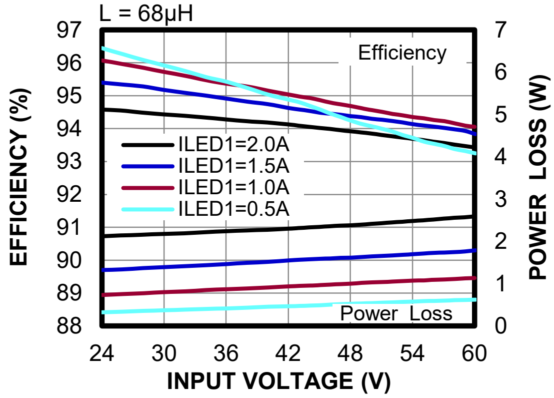


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted. (4)

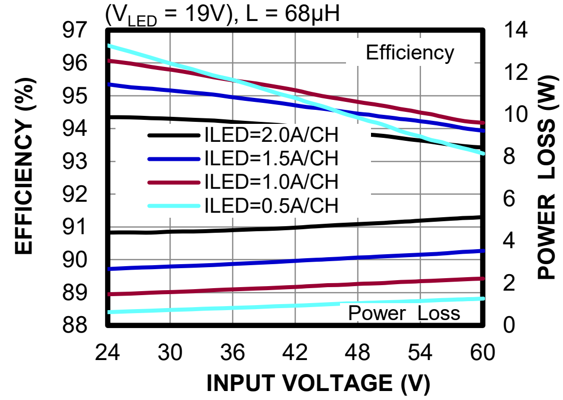
Efficiency vs. Input Voltage vs. Power Loss

Buck 1 only, 6 LEDs (V_{LED} = 19V), L = 68µH



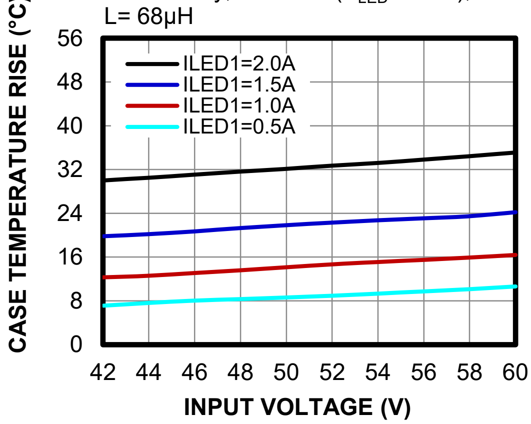
Efficiency vs. Input Voltage vs. Power Loss

Buck 1 and buck 2, 6 LEDs (V_{LED} = 19V), L = 68µH



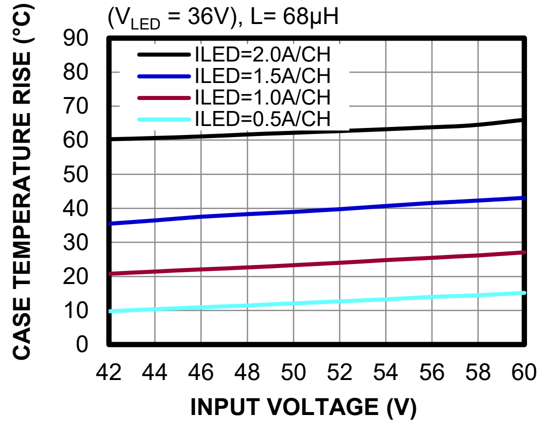
Case Temperature Rise vs. Input Voltage

Buck 1 only, 12 LEDs (V_{LED} = 36V), L= 68µH



Case Temperature Rise vs. Input Voltage

Buck 1 and buck 2, 12 LEDs (V_{LED} = 36V), L= 68µH



Note:

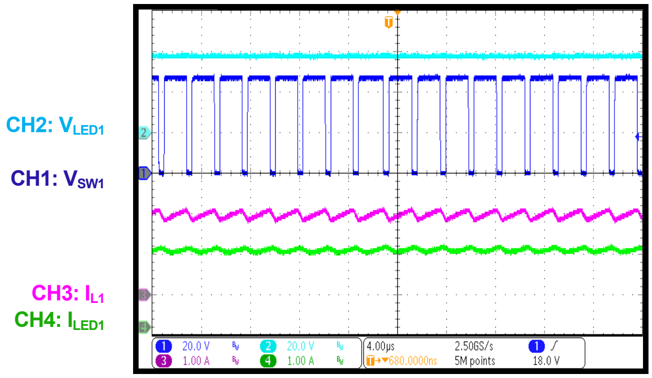
4) Using the 7447709680 inductor from Wurth (L = 68µH, R_{BST} = 0Ω).

EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

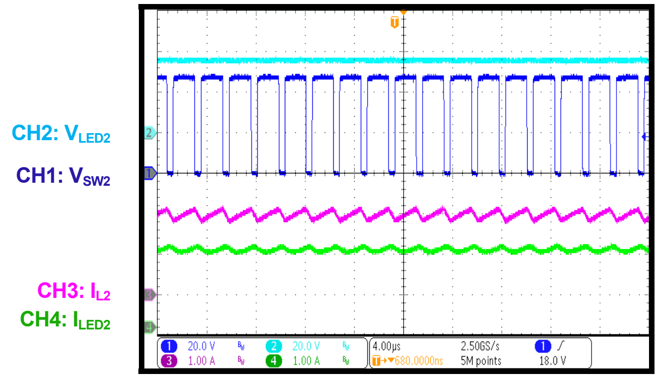
Steady State (Buck 1)

I_{LED1} = I_{LED2} = 2A



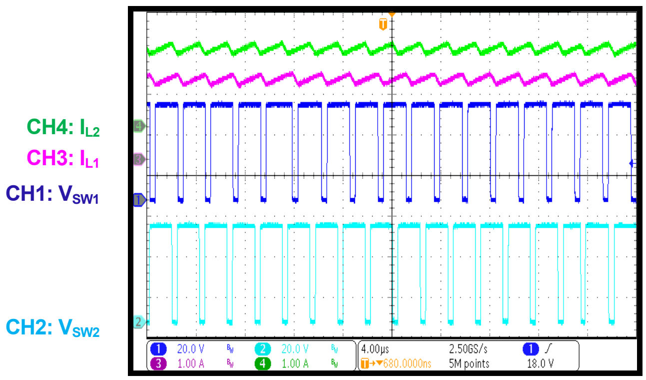
Steady State (Buck 2)

I_{LED1} = I_{LED2} = 2A



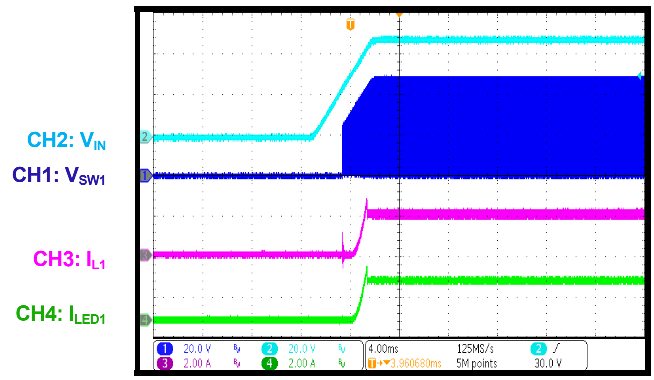
Steady State

I_{LED1} = I_{LED2} = 2A



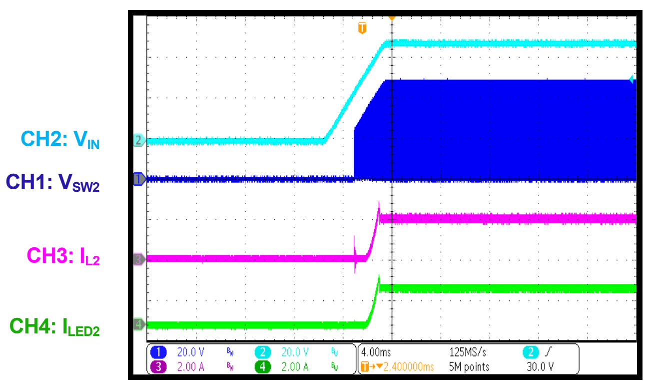
Start-Up through VIN (Buck 1)

I_{LED1} = I_{LED2} = 2A



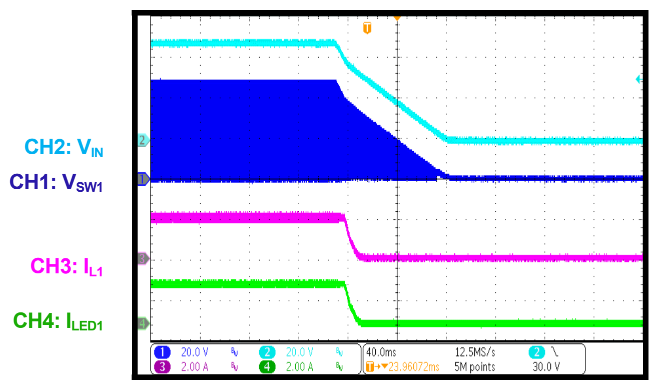
Start-Up through VIN (Buck 2)

I_{LED1} = I_{LED2} = 2A



Shutdown through VIN (Buck 1)

I_{LED1} = I_{LED2} = 2A

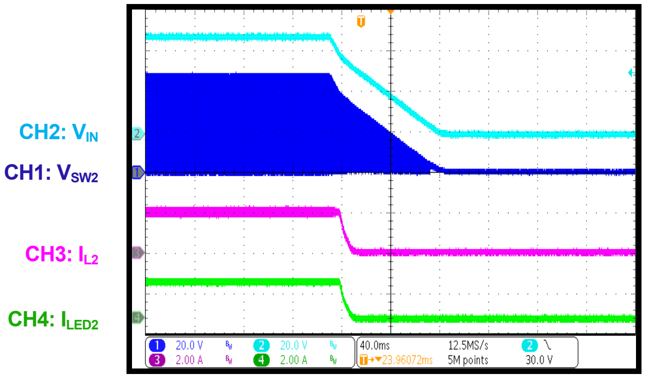


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

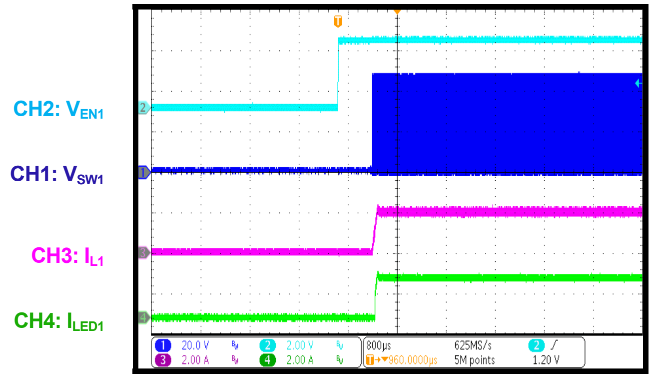
Shutdown through VIN (Buck 2)

I_{LED1} = I_{LED2} = 2A



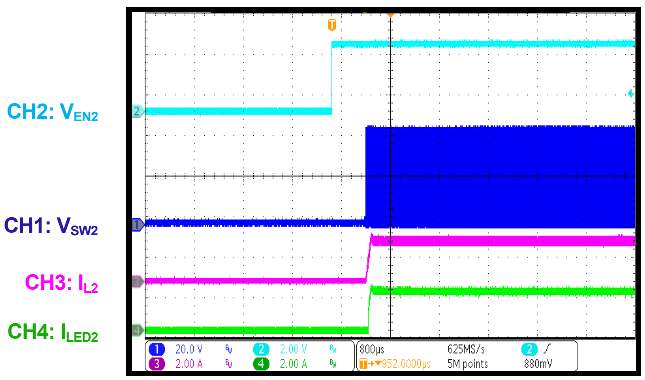
Start-Up through EN1 (Buck 1)

I_{LED1} = I_{LED2} = 2A



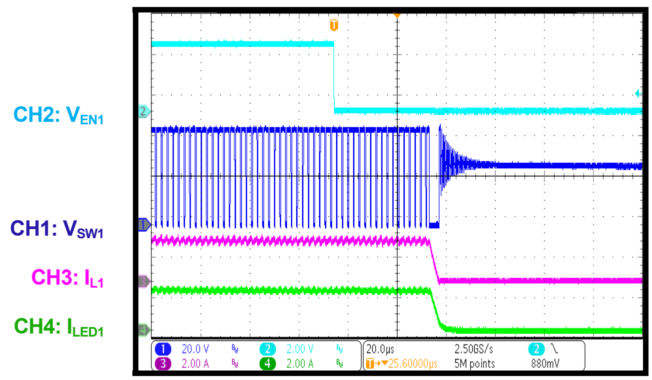
Start-Up through EN2 (Buck 2)

I_{LED1} = I_{LED2} = 2A



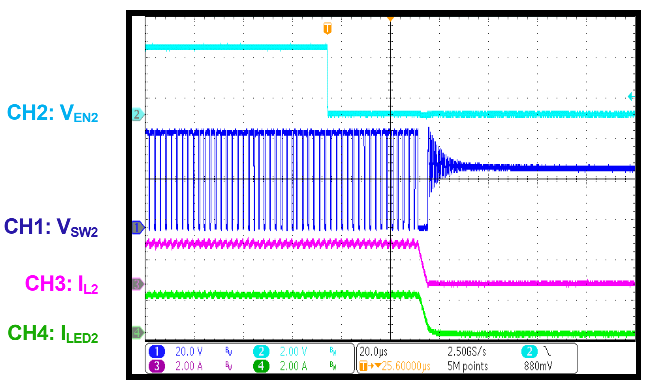
Shutdown through EN1 (Buck 1)

I_{LED1} = I_{LED2} = 2A



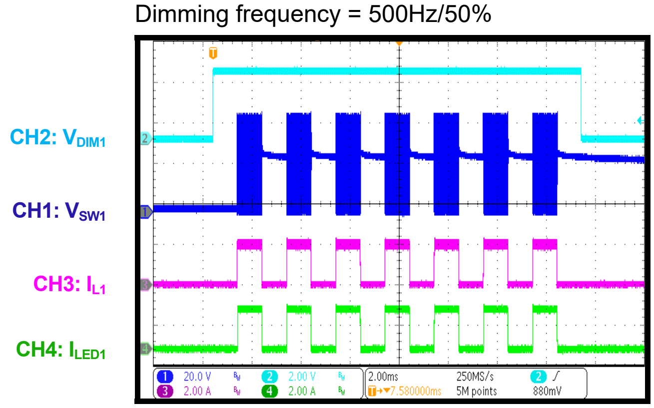
Shutdown through EN2 (Buck 2)

I_{LED1} = I_{LED2} = 2A



PWM Dimming Mode 1 Steady State (Buck 1)

Dimming frequency = 500Hz/50%

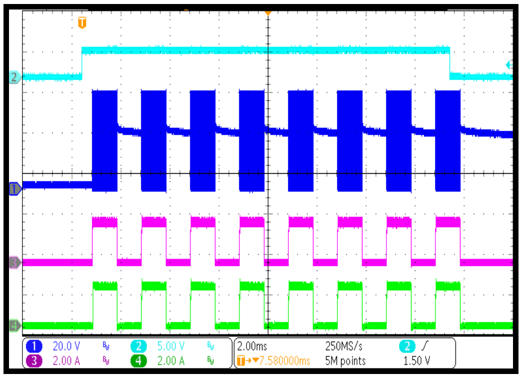


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

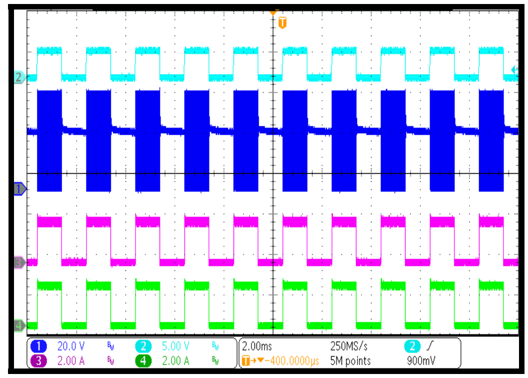
PWM Dimming Mode 1 Steady State (Buck 2)

Dimming frequency = 500Hz/50%



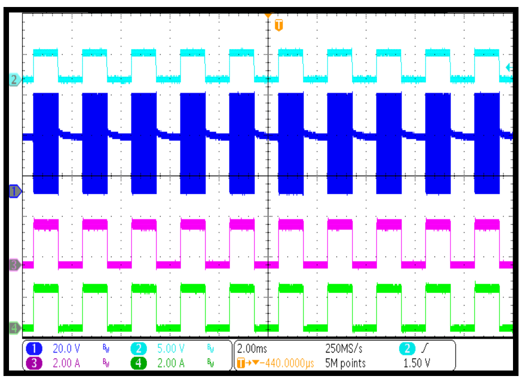
PWM Dimming Mode 2 Steady State (Buck 1)

Dimming frequency = 500Hz/50%



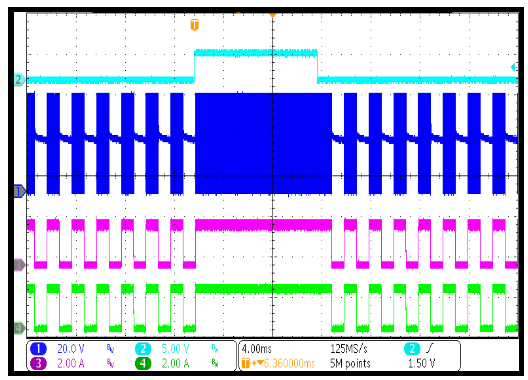
PWM Dimming Mode 2 Steady State (Buck 2)

Dimming frequency = 500Hz/50%



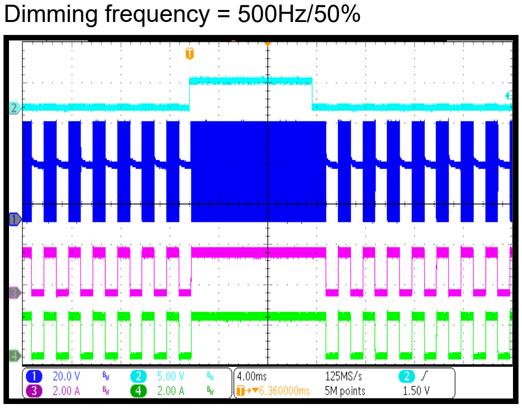
PWM Dimming Mode 3 (Buck 1)

Dimming frequency = 500Hz/50%



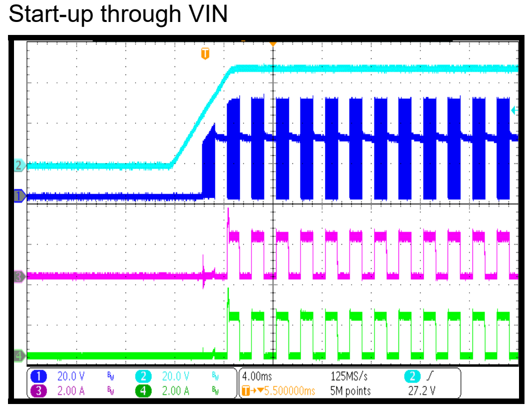
PWM Dimming Mode 3 (Buck 1)

Dimming frequency = 500Hz/50%



PWM Dimming Mode 2 (Buck 1)

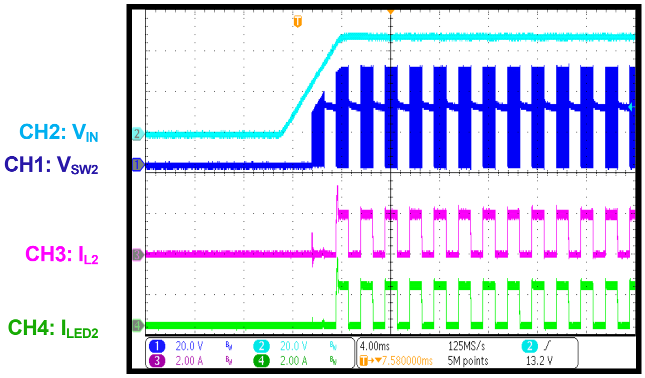
Start-up through VIN



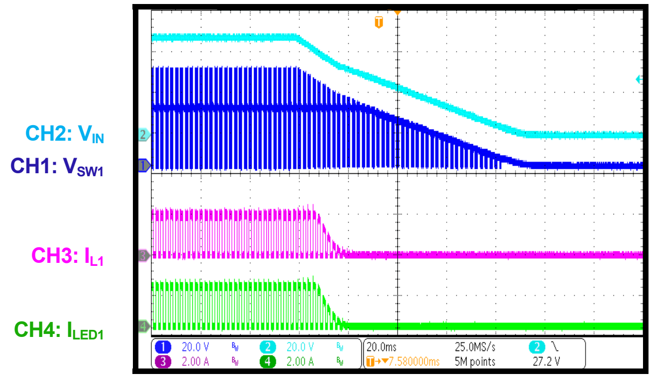
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

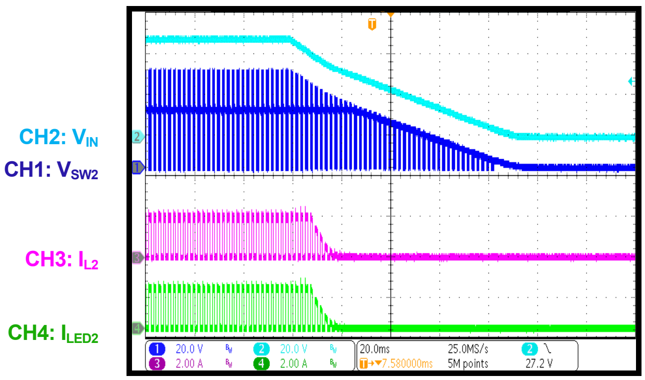
PWM Dimming Mode 2 (Buck 2)
Start-up through VIN



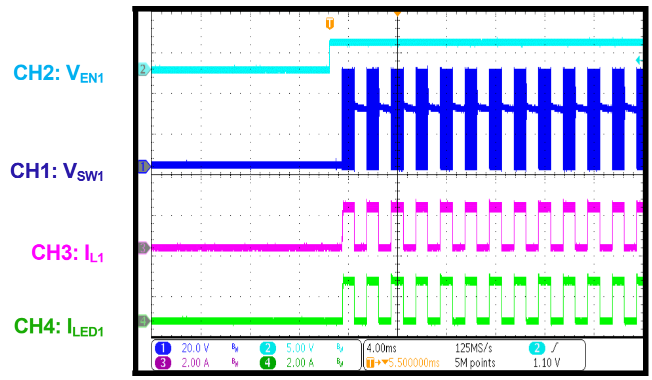
PWM Dimming Mode 2 (Buck 1)
Shutdown through VIN



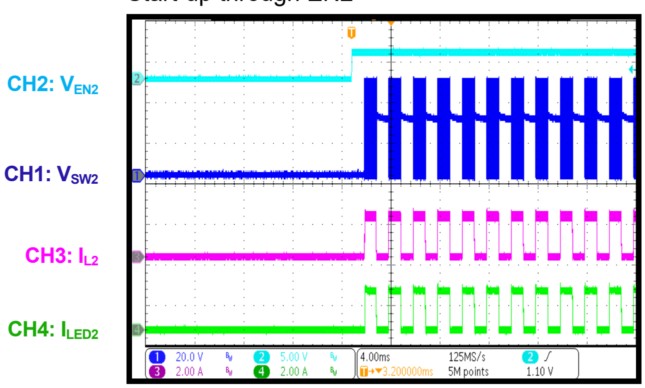
PWM Dimming Mode 2 (Buck 2)
Shutdown through VIN



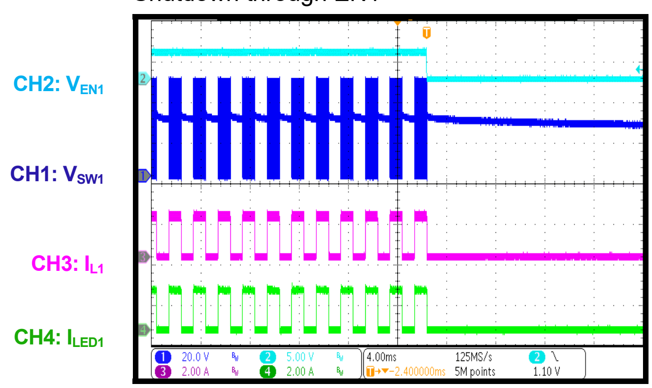
PWM Dimming Mode 2 (Buck 1)
Start-up through EN1



PWM Dimming Mode 2 (Buck 2)
Start-up through EN2



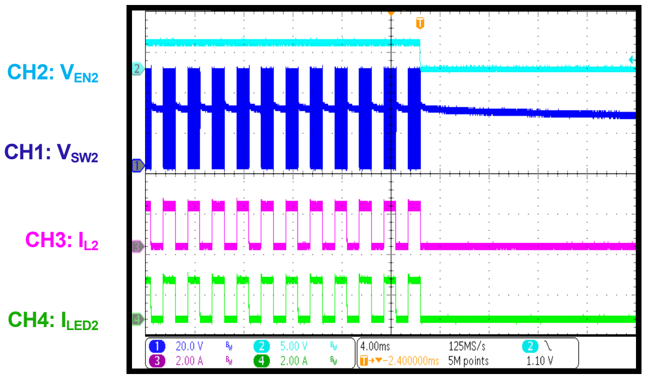
PWM Dimming Mode 2 (Buck 1)
Shutdown through EN1



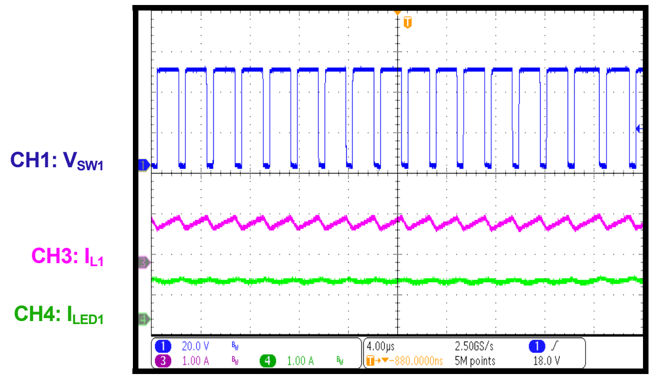
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

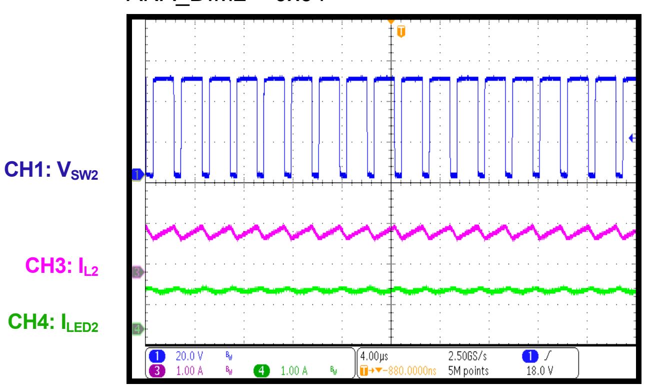
PWM Dimming Mode 2 (Buck 2)
Shutdown through EN2



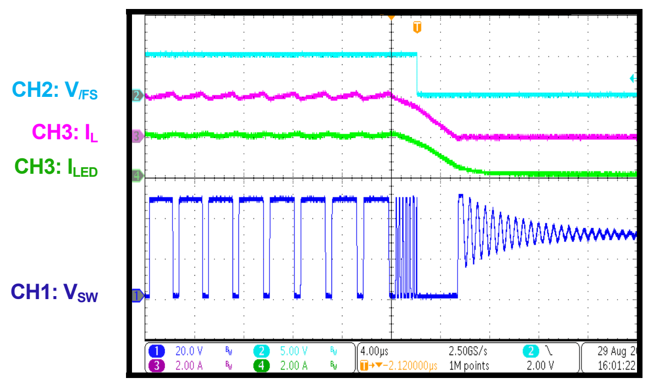
Analog Dimming
ANA_DIM1 = 0x64 (V_{REF} = 100mV)



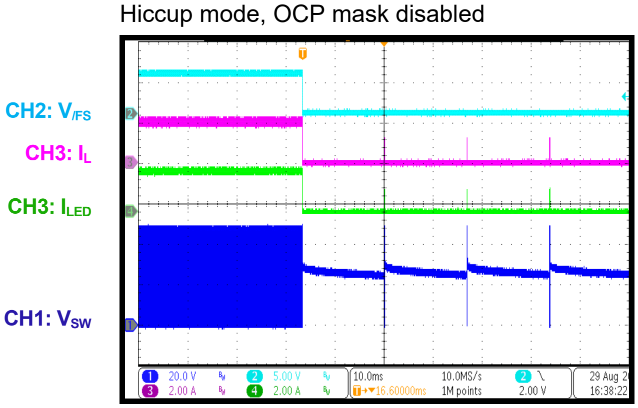
Analog Dimming
ANA_DIM2 = 0x64



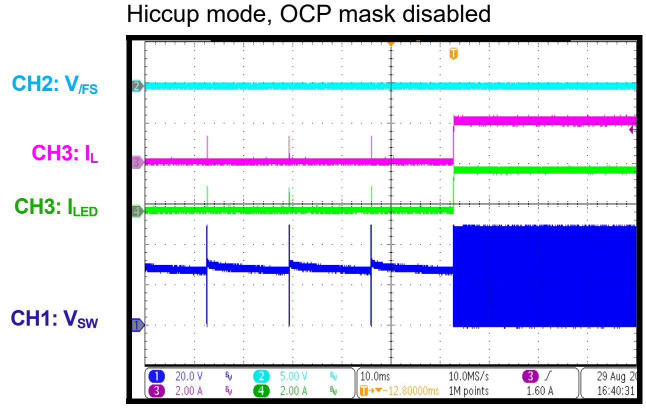
OCP Entry
Latch mode, OCP mask disabled



OCP Entry
Hiccup mode, OCP mask disabled



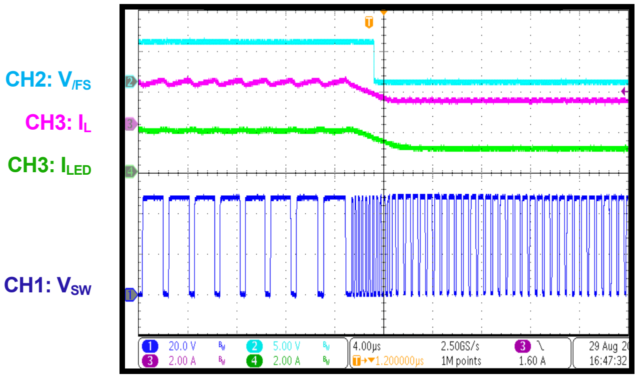
OCP Recovery
Hiccup mode, OCP mask disabled



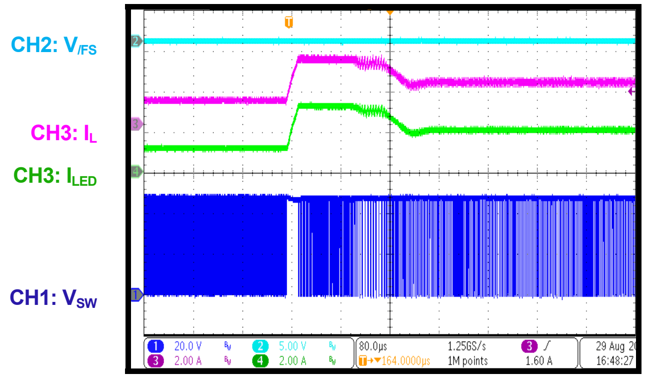
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68μH, T_A = 25°C, unless otherwise noted.

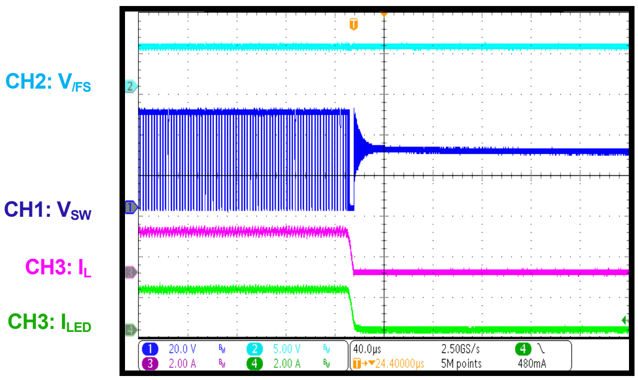
OCP Entry
No action mode, OCP mask disabled



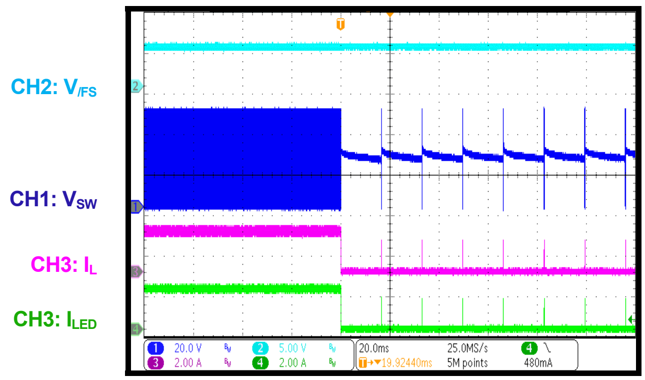
OCP Recovery
No action mode, OCP mask disabled



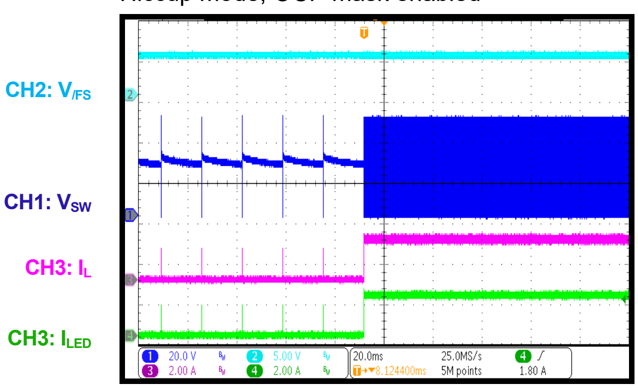
OCP Entry
Latch mode, OCP mask enabled



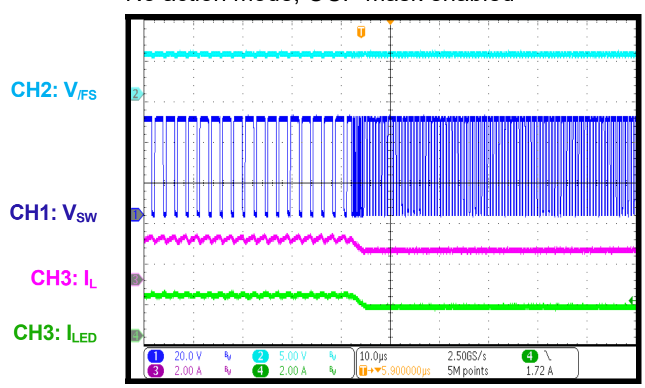
OCP Entry
Hiccup mode, OCP mask enabled



OCP Recovery
Hiccup mode, OCP mask enabled



OCP Entry
No action mode, OCP mask enabled

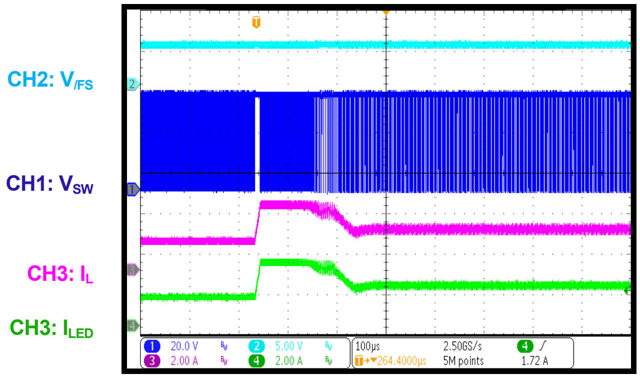


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

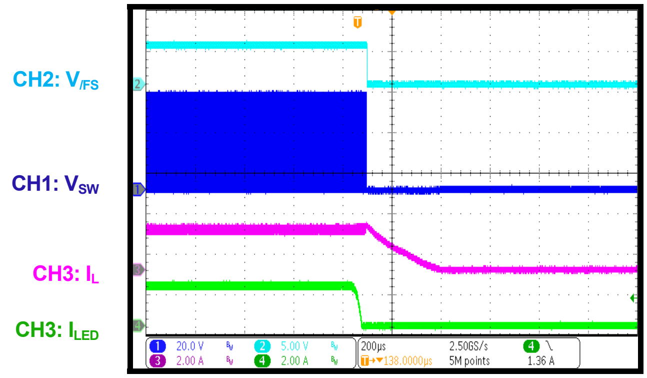
OCP Recovery

No action mode, OCP mask enabled



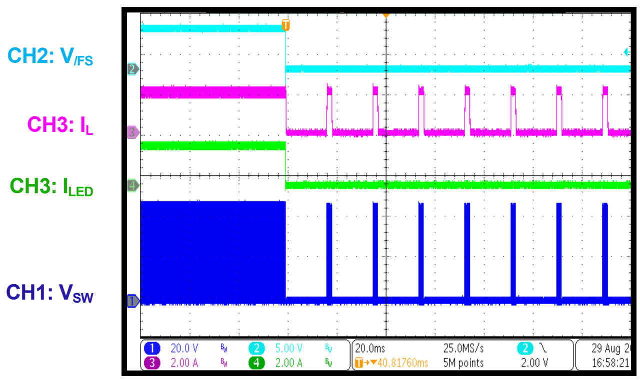
UVP Entry

Latch mode, UVP mask disabled



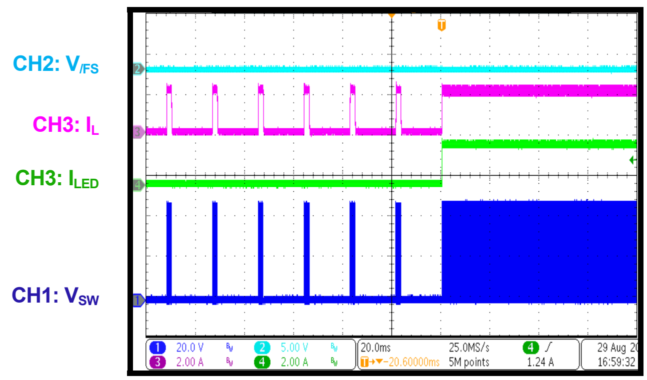
UVP Entry

Hiccup mode, UVP mask disabled



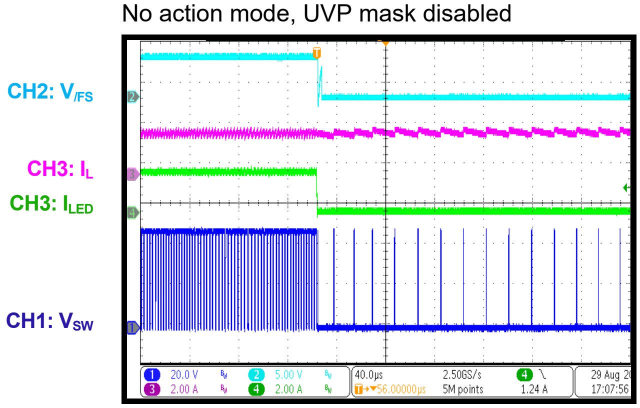
UVP Recovery

Hiccup mode, UVP mask disabled



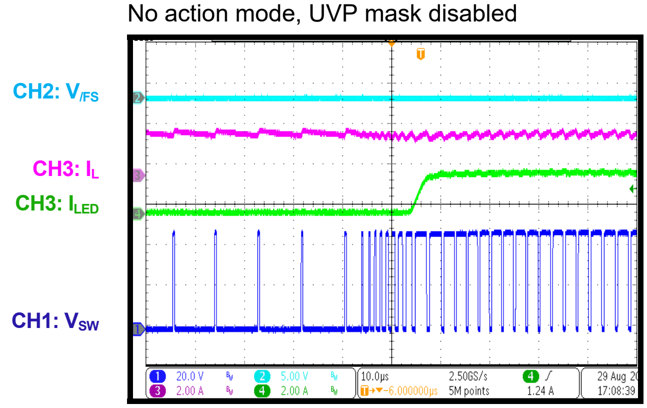
UVP Entry

No action mode, UVP mask disabled



UVP Recovery

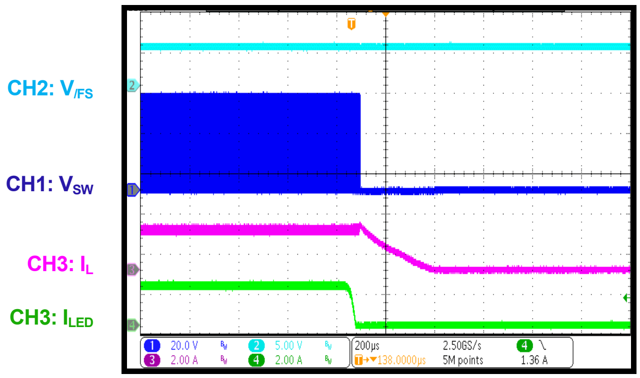
No action mode, UVP mask disabled



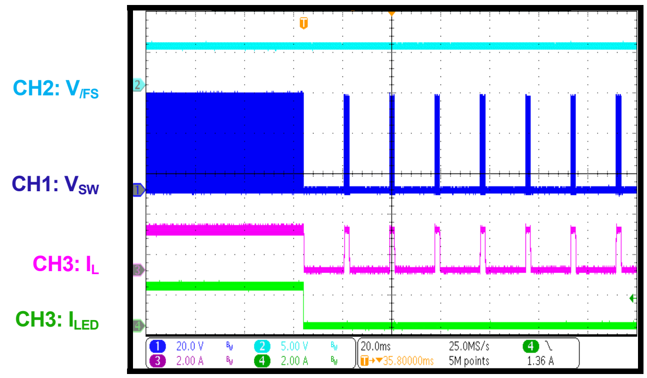
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68µH, T_A = 25°C, unless otherwise noted.

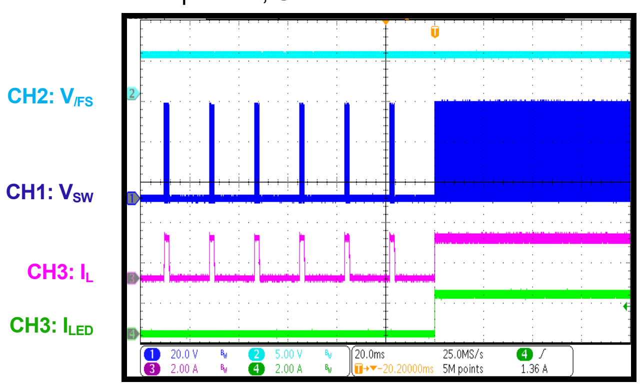
UVP Entry
Latch mode, UVP mask enabled



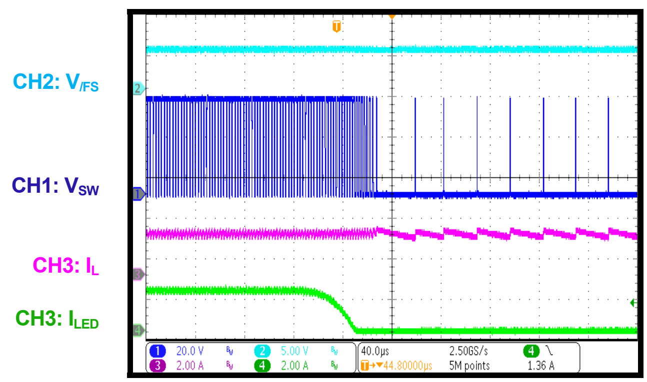
UVP Entry
Hiccup mode, UVP mask enabled



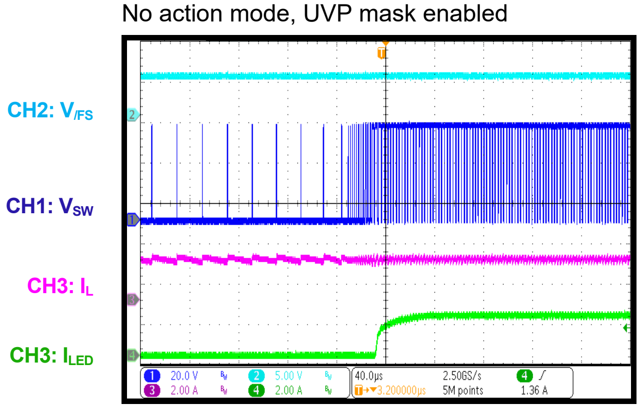
UVP Recovery
Hiccup mode, UVP mask enabled



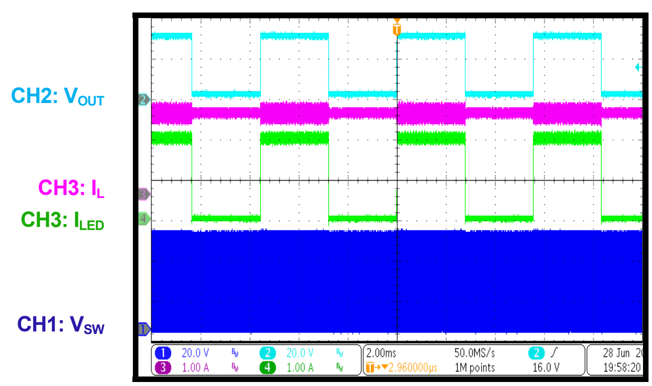
UVP Entry
No action mode, UVP mask enabled



UVP Recovery
No action mode, UVP mask enabled



Shunt Dimming
UVP disabled

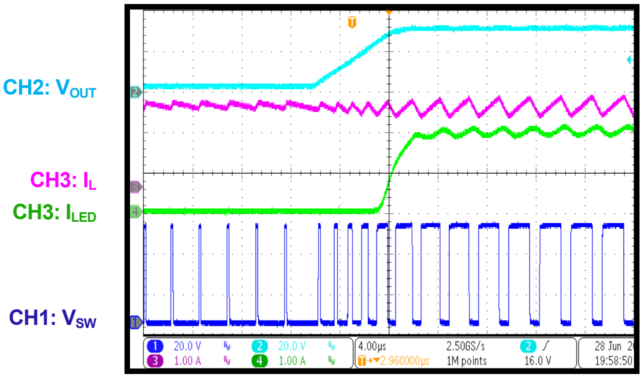


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 48V, I_{LED1} = I_{LED2} = 2A, 12 LEDs in series (V_{LED1} = V_{LED1} = 38V) for each channel, f_{SW1} = f_{SW2} = 420kHz, L1 = L2 = 68μH, T_A = 25°C, unless otherwise noted.

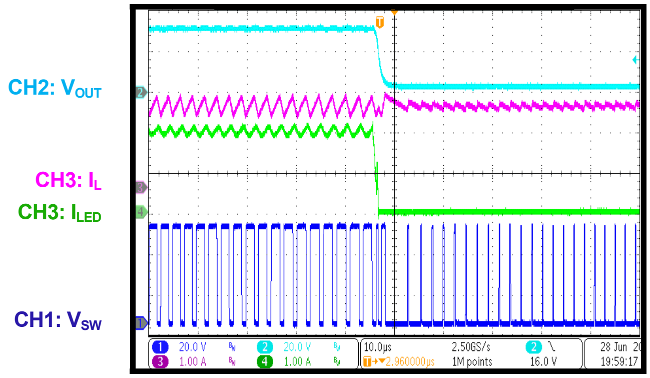
Shunt Dimming On

UVP disabled, LED off to on: 0V to 36V



Shunt Dimming Off

UVP disabled, LED on to off: 36V to 0V



PCB LAYOUT

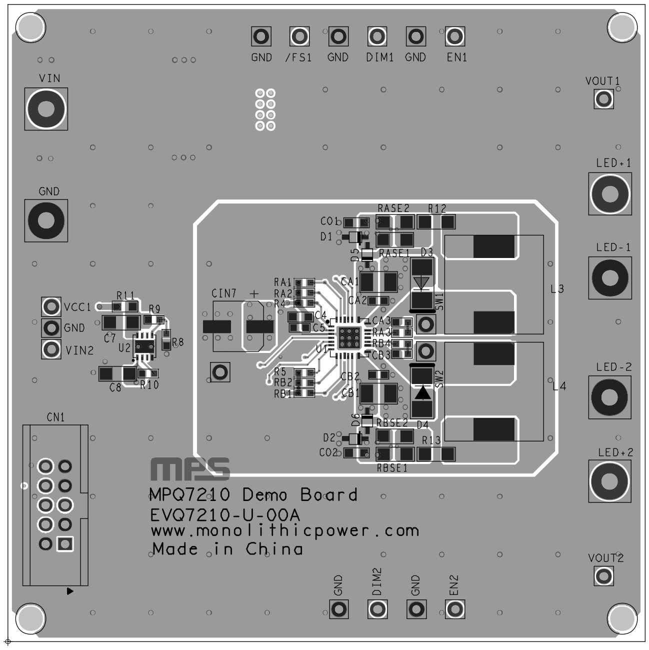


Figure 19: Top Silk and Top Layer

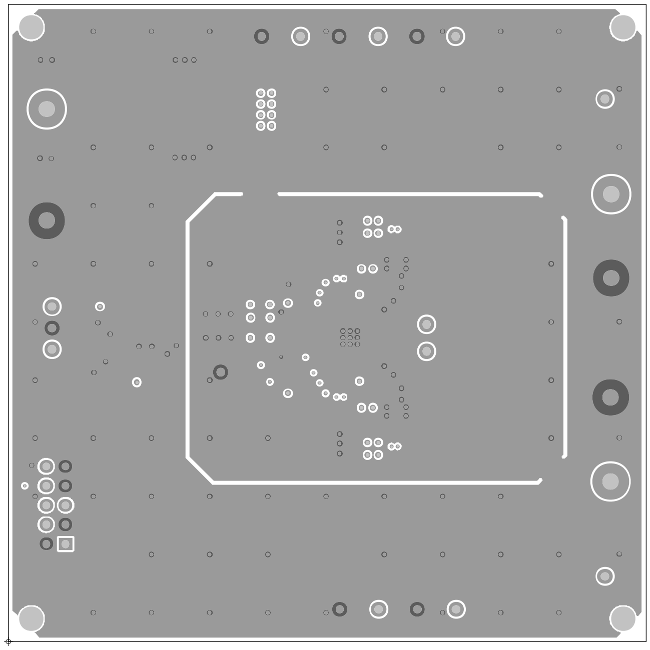


Figure 20: Mid-Layer 1

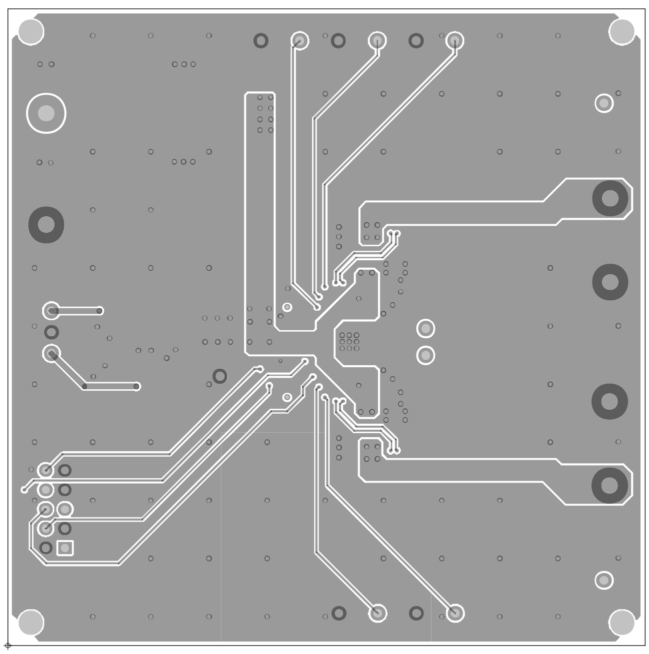


Figure 21: Mid-Layer 2

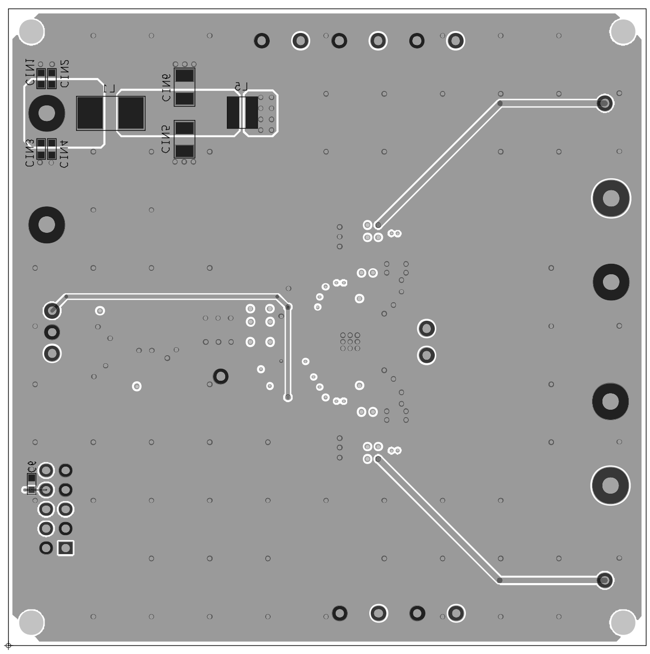


Figure 22: Bottom Layer and Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	9/20/2023	Initial Release	-