EVQ2484-F-00A

75V, Multi-Topology LED Controller with Multiple Dimming Modes Evaluation Board, AEC-Q100 Qualified

DESCRIPTION

The EVQ2484-F-00A evaluation board is designed to demonstrate the capabilities of the MPQ2484-AEC1 and MPQ2484U-AEC1. The MPQ2484-AEC1 and MPQ2484U-AEC1 are flexible, multi-topology, asynchronous controllers for LED lights with a high brightness. The MPQ2484-AEC1 uses gold bond wiring, and the MPQ2484U-AEC1 uses copper bond wiring. Both devices supports buck, boost, and buck-boost configurations, which makes them well-suited for multi-purpose applications. Peak current control mode provides fast transient response and eases loop stabilization.

The switching frequency (f_{SW}) can be set using the FSET pin, or it can be synchronized using a 100kHz to 2.2MHz external clock signal. The configurable frequency spread spectrum (FSS) function can periodically enable dither switching to improve EMI.

The EVQ2484-F-00A is a fully assembled and tested LED controller evaluation board, and supports boost mode and buck-boost mode configuration. It features a wide 4.5V to 45V input voltage (V_{IN}) range, with a maximum boost voltage up to 75V.

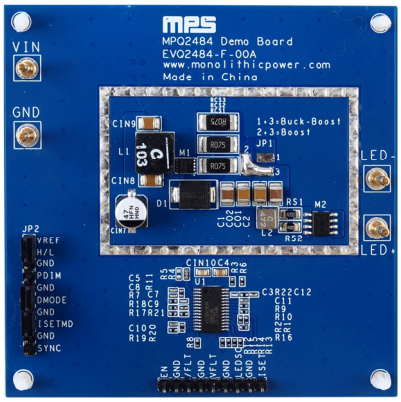
The MPQ2484-AEC1 and MPQ2484U-AEC1 are available in a TSSOP-28EP package, and are available in AEC-Q100 Grade 1.

PERFORMANCE SUMMARY

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

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4.5V to 75V
Typical efficiency	V_{IN} = 12V, V_{OUT} = 36V, I_{OUT} = 1A, boost mode	92.1%
	V_{IN} = 12V, V_{OUT} = 24V, I_{OUT} = 1.5A, buck-boost mode	88%
Peak efficiency	V_{IN} = 30V, V_{OUT} = 36V, I_{OUT} = 1A, boost mode	95.2%
	V_{IN} = 18V, V_{OUT} = 24V, I_{OUT} = 1.5A, buck-boost mode	89.1%
Switching frequency		0.1 to 2.2MHz

EVALUATION BOARD



LxWxH (8.2cmx8.2cmx0.77cm)

Board Number	MPS IC Number
EVQ2484-F-00A	MPQ2484GF-AEC1
	MPQ2484UGF-AEC1

QUICK START GUIDE

The EVQ2484-F-00A evaluation board is easy to set up and use to evaluate the performance of the MPQ2484-AEC1 and MPQ2484U-AEC1. For proper measurement equipment set-up, refer to Figure 4 on page 4 and follow the steps below:

1. The default board configuration is boost mode, with pin 2 shorted to pin 3 of JP1 (pin 1 floating). Short pin 1 and pin 3 (float pin 2) to change the board configuration to buck-boost mode.
2. Preset the power supply between 9V and 20V, then turn off the power supply.
3. If longer cables are used between the source and the evaluation board (>0.5m total), place a damping capacitor at the input terminals, especially when V_{IN} exceeds 24V.
4. Prepare eight LEDs in series and ensure each LED can hold ≥1.5A current. Connect the load terminals to:
   a. Positive (+): LED+
   b. Negative (-): LED-
5. Connect LEDSC1 to the positive terminal of the second LED (see Figure 4 on page 4). There should be one LED between LED+ and LEDSC1.
6. After making the connections, turn on the power supply. The board should automatically start up, and the LED should turn on.
7. The external resistors (RS1 and RS2) connected between ICS+ and ICS- set the LED current (I_{LED}). Calculate RS1 and RS2 with Equation (1):

$$I_{LED} = \frac{V_{REF}}{RS1//RS2} \quad (1)$$

8. If the load number is not eight LEDs in series, make the following changes:
   a. Using a number other than 8 LEDs in series triggers one or more LED short protection, which is enabled by default. Ensure that R13 = (2K - 1) x R14 (where K is the LED number of the LED strings) and that R12 = R15 (see Figure 1). If this protection is not used, short LEDSC1 and LEDSC2 to LED+.

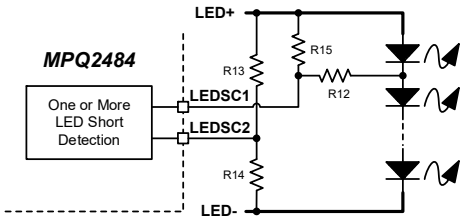


Figure 1: One or More LED Short Protection

   b. Change the over-voltage protection (OVP) voltage (V_{OVP}). Ensure that V_{OVP} is 10% to 30% greater than the maximum output voltage (LED string voltage). V_{OVP} can be calculated with Equation (2):

$$V_{OVP} = \frac{R1 + R2}{R2} \times 1.17 \quad (2)$$

   For applications with eight LEDs in series, set R13 = 100kΩ, R14 = 6.65kΩ, and R12 = R15 = 6.65kΩ (see Figure 1).

9. By default, the VREF pin and H/L pin are connected to disable two-step dimming mode. If the VREF pin and H/L pin are disconnected from each other and the H/L pin is pulled low, then the part enters two-step dimming mode.
10. To change the board's default two-step dimming setting, remove the connector between VREF and H/L on JP2, then pull H/L low. The part then enters two-step dimming mode. To enable PWM dimming, change C9 to a 8.06kΩ resistor and connect the VREF and H/L pins together. Then an external pulse-width modulation (PWM) waveform can be applied to the PDIM pin. Ensure that the minimum PWM dimming on time is longer than 60μs, or the part will stop switching.
11. By default, the DMODE pin is connected to GND via the dimming P-channel MOSFET. If the P-channel MOSFET is not needed, pull the DMODE pin high. The P-channel MOSFET enables LED+ short to LED- protection during boost mode and improves dimming performance.
12. To see the /FLT pin state, connect the FLT voltage (V_{FLT}) to a 5V power supply.
13. The ISET voltage (V_{ISET}) can set the reference voltage (V_{REF}) for the LED current regulator. When ISETMD is pulled down to GND and V_{ISET} rises up from 0.6V to 1.8V, V_{REF} rises from 0mV to 200mV linearly (see Figure 2). When V_{ISET} exceeds 2.3V, V_{REF} remains about 100mV.

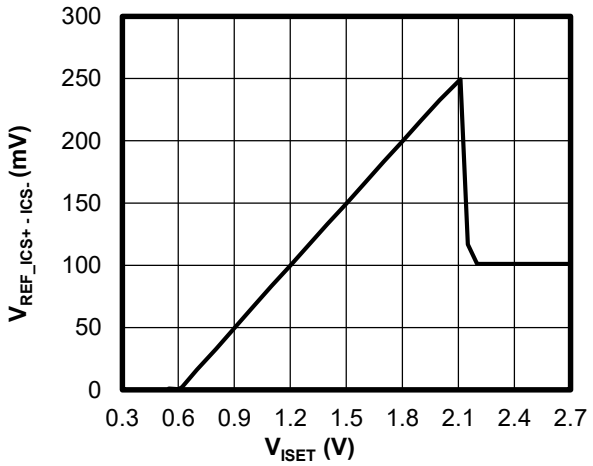


Figure 2: ISETMD Is Low

If ISETMD is pulled high and V_{ISET} rises from 0.6V to 1.2V, V_{REF} rises from 0mV to 100mV (see Figure 3). If the ISET pin is left floating, the current reference is fixed at 100mV.

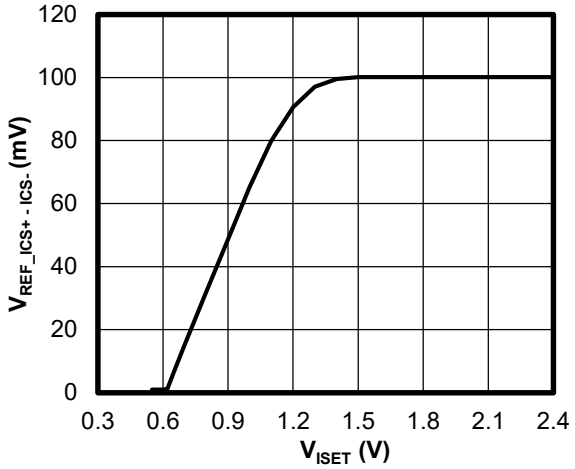


Figure 3: ISETMD Is High

V_{ISET} can be estimated with Equation (3):

$$V_{ISET} = 100 \times \frac{0.805 \times R10}{R9} \quad (3)$$

Figure 4 shows the measurement equipment set-up.

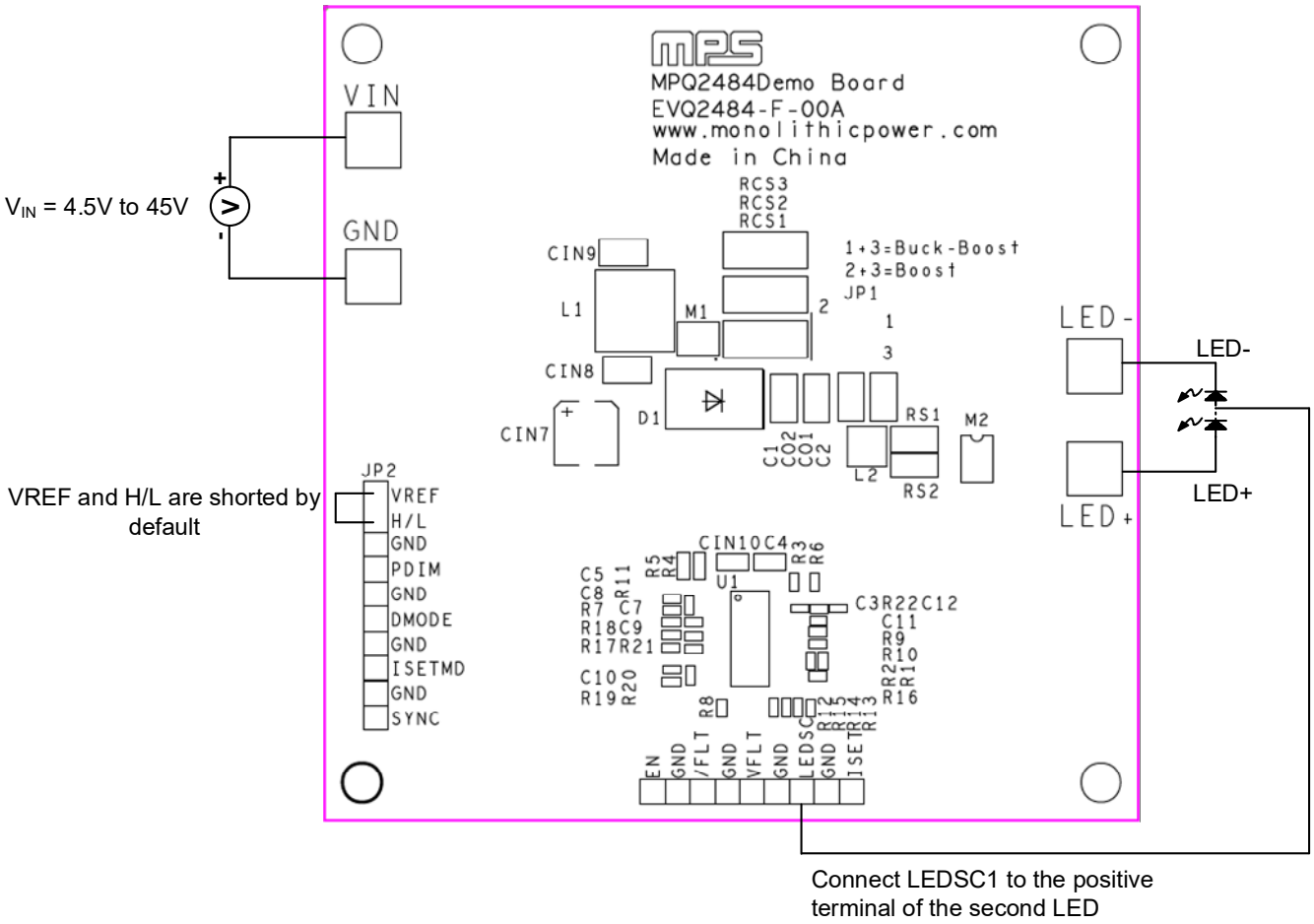


Figure 4: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

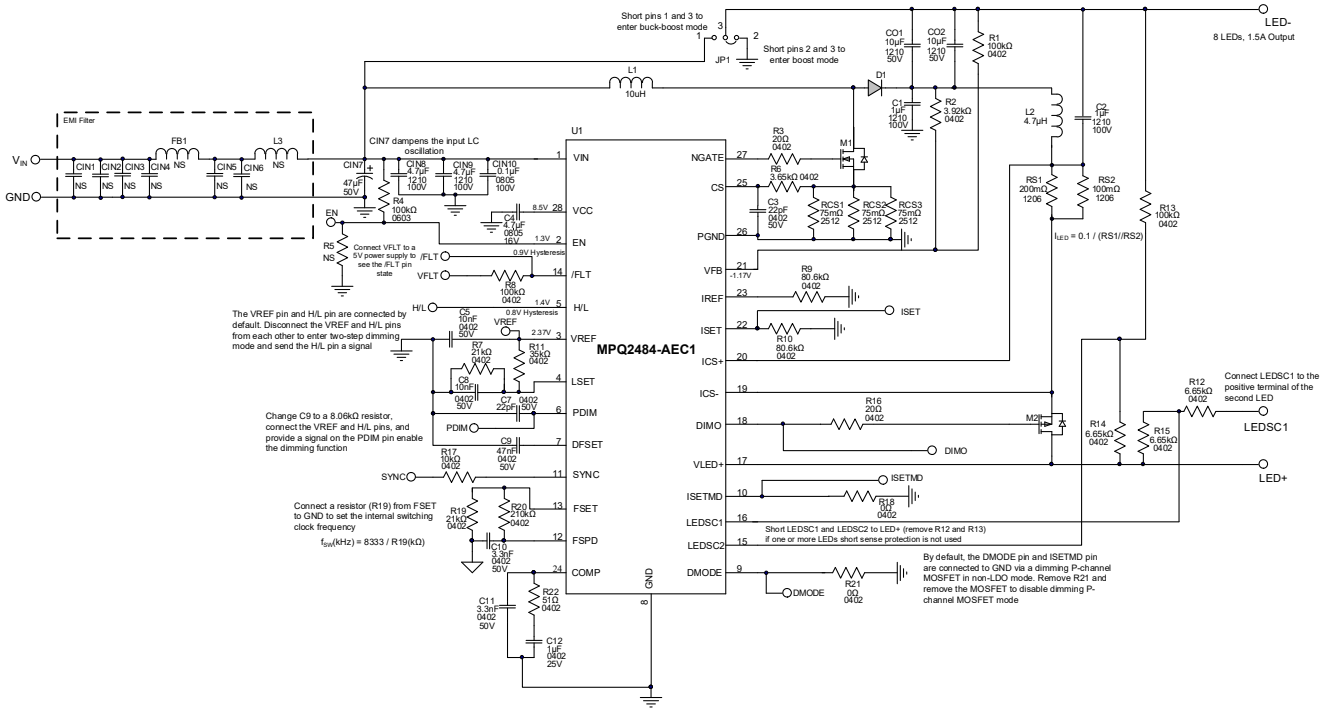


Figure 5: Evaluation Board Schematic

EVQ2484-F-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
4	CIN1, CIN2, CIN3, CIN4	NS	Capacitor, 100V, X7R	0603		
2	CIN5, CIN6	NS	Capacitor, 100V, X7R	1210		
1	CIN7	47µF	Capacitor, 50V	SMD	Panasonic	EEEFN1H470XP
2	CIN8, CIN9	4.7µF	Capacitor, 100V, X7S	1210	TDK	C3225X7S2A475K
1	CIN10	100nF	Capacitor, 100V, X7R	0805	Wurth	885012207128
2	CO1, CO2	10µF	Ceramic capacitor, 50V, X7R	1210	Murata	GRM32ER71'H106KA12L
2	C1, C2	1µF	Capacitor, 100V, X7R	1210	Murata	GRM32ER72A105KA01L
1	C3	22pF	Capacitor, 50V, C0G	0402	Murata	GRM1555C1H220JA01D
1	C4	4.7µF	Capacitor, 16V, X7R	0805	Murata	GCM21BR71C475KA73L
1	C5	10nF	Capacitor, 50V, X7R	0402	Murata	GRM155R71H103KA88D
1	C7	22pF	Capacitor, 50V, C0G	0402	Murata	GRM1555C1H220JA01D
1	C8	10nF	Capacitor, 50V, X7R	0402	Murata	GRM155R71H103KA88D
1	C9	47nF	Capacitor, 50V, X7R	0402	Murata	GRM155R71H473KE14D
2	C10, C11	3.3nF	Capacitor, 50V, X7R	0402	Murata	GRM155R71H332KA01D
1	C12	1µF	Capacitor, 25V, X5R	0402	Murata	GRM155R61E105KA12
1	D1	100V	Diode, 100V, 10A	SMC	MIC	SS10100
1	FB1	NS	Inductor, 14.4mΩ, 11A	SMD	Coilcraft	XAL6060-472MEB/C
1	L1	10µH	Inductor, 23.1mΩ, 8.7A	SMD	Coilcraft	XAL8080-103MEB
1	L2	4.7µH	Inductor, 4.5A	SMD	Coilcraft	XAL4030-472MEB
1	L3	NS	Inductor, 14.4mΩ, 11A	SMD	Coilcraft	XAL6060-472MEB/C
1	M1	80V	MOSFET, 80V, 7mΩ, 14nC, 40A	TSDSON-8	Infineon	BSZ070N08LS5ATMA1
1	M2	60V	P-channel MOSFET, 60V, 23mΩ, 46nC, 9.3A	SO-8	Analog Power	AM4417P-T1-PF
3	RCS1, RCS2, RCS3	75mΩ	Film resistor, 1%	2512	Yageo	RL2512FK-070R075L
1	RS1	200mΩ	Film resistor, 1%	1206	Yageo	RL1206FR-070R2L
1	RS2	100mΩ	Film resistor, 1%	1206	Cyntec	VSRP1206S1-R100F
1	R1	100kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-07100KL
1	R2	3.92kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-073K92L
2	R3, R16	20Ω	Film resistor, 1%	0402	Yageo	RC0402FR-0720RL

1	R4	100kΩ	Film resistor, 1%	0603	Yageo	RC0603JR-07100KL
1	R5	NS	Film resistor, 1%	0603		
1	R6	3.65kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-073K65L
2	R7, R19	21kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-0721KL
2	R8, R13	100kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-07100K
2	R9, R10	80.6kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-0780K6L
1	R11	35.7kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-0735K7L
3	R12, R14, R15	6.65kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-076K65L
1	R17	10kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-0710KL
2	R18, R21	0Ω	Film resistor, 1%	0402	Yageo	RC0402FR-070RL
1	R20	210kΩ	Film resistor, 1%	0402	Yageo	RC0402FR-07210KL
1	R22	51Ω	Film resistor, 1%	0402	Yageo	RC0402FR-0751RL
1	JP1	NS	Short pins 2 and 3 to enter boost mode; short pins 1 and 3 pin to enter buck-boost mode	NS		
1	JP2	1mm	2.54mm test pin	DIP	Custom (1)	
17	VFLT, SYNC, PDIM, ISETM, ISET, EN, DMODE, /FLT, LEDSC1, GND	1mm	2.54mm test pin	DIP	Custom (1)	
4	VIN, LED-, LED+, GND	2mm	2mm golden pin	DIP	Custom (1)	
1	U1	MPQ2484-AEC1	Multi-topology LED controller	TSSOP-28EP	MPS	MPQ2484GF-AEC1

Notes:

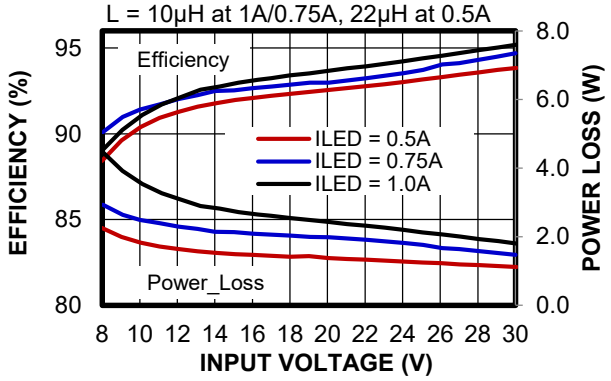
1) MPS custom-produces these pins. Contact an MPS FAE for more information.

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10μH, T_A = 25°C, unless otherwise noted. (2)

Efficiency vs. Input Voltage vs. Power Loss

12 LEDs (V_{LED} = 36V),
L = 10μH at 1A/0.75A, 22μH at 0.5A



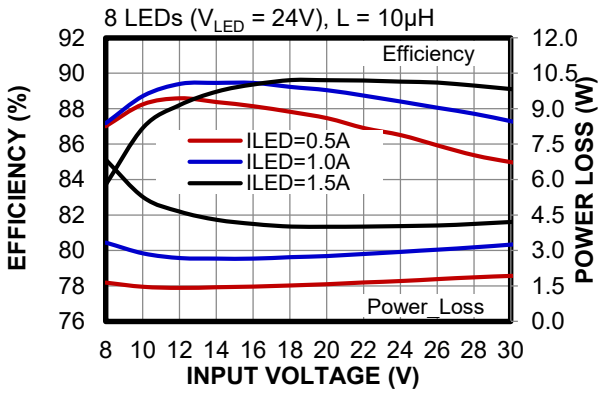
Note:

2) Inductor information: L = 10μH (XAL8080-103MEB), L = 22μH (XAL5050-223MEB).

EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10μH, T_A = 25°C, unless otherwise noted. (3)

Efficiency vs. Input Voltage vs. Power Loss



Note:

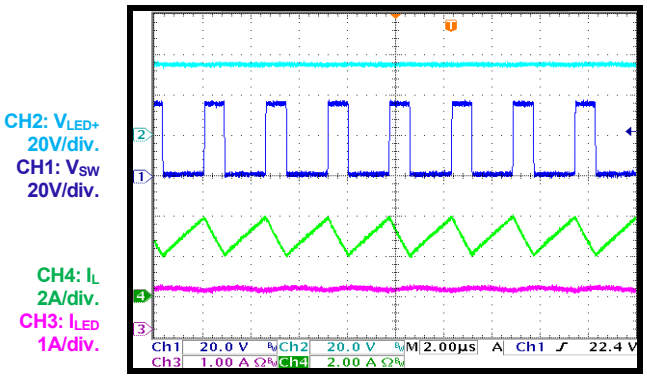
3) Inductor information: L = 10μH (XAL8080-103MEB), L = 22μH (XAL5050-223MEB).

EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

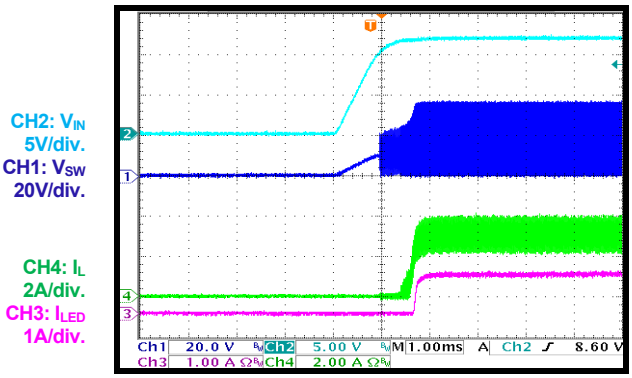
Steady State

I_{LED} = 1A



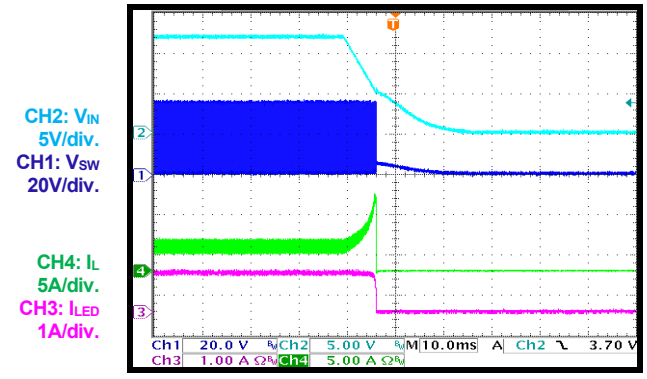
Start-Up through VIN

I_{LED} = 1A



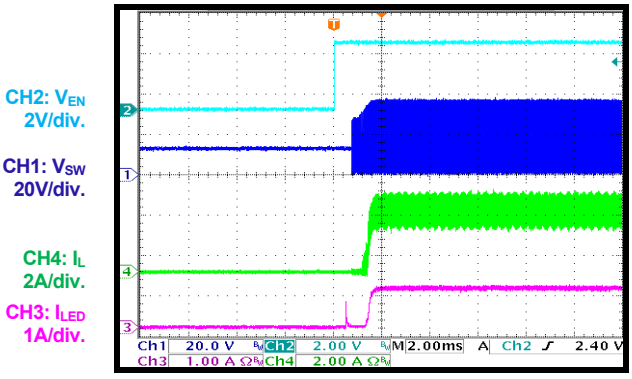
Shutdown through VIN

I_{LED} = 1A



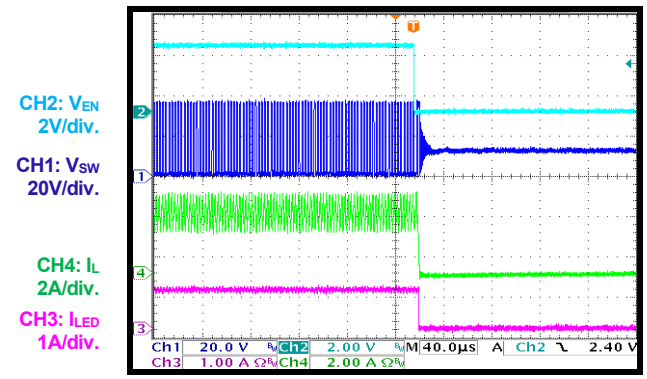
Start-Up through EN

I_{LED} = 1A



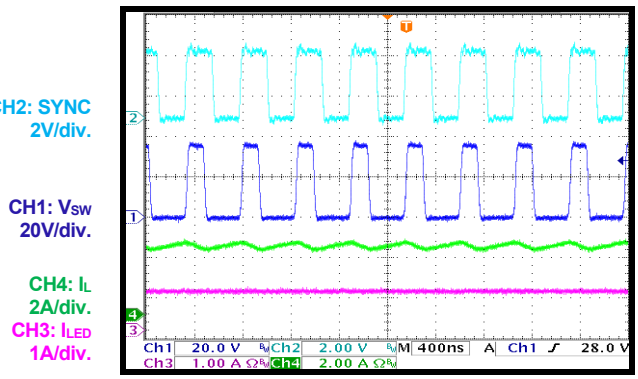
Shutdown through EN

I_{LED} = 1A



SYNC Function Steady State

SYNC frequency = 2.2MHz

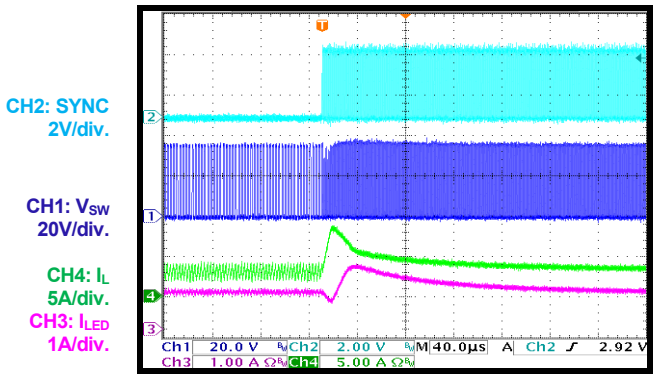


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

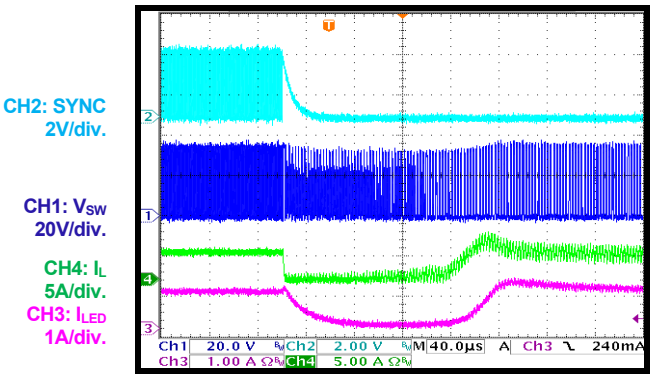
SYNC IN

SYNC frequency = 2.2MHz



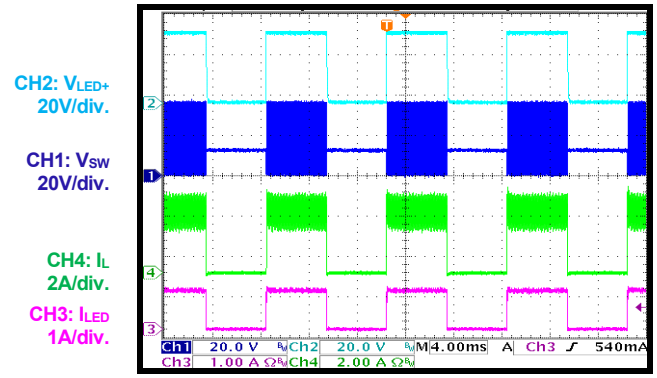
SYNC OUT

SYNC frequency = 2.2MHz



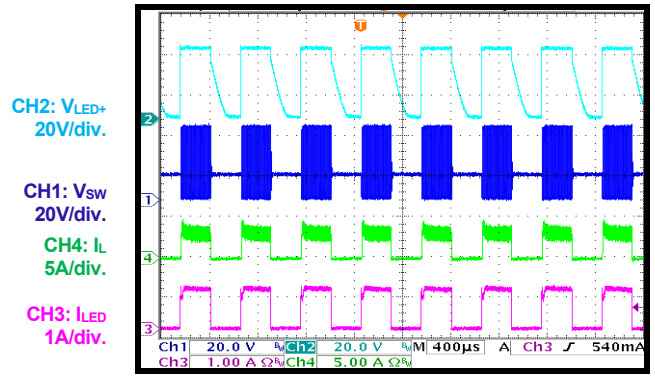
PWM Dimming Steady State

Dimming frequency = 100Hz

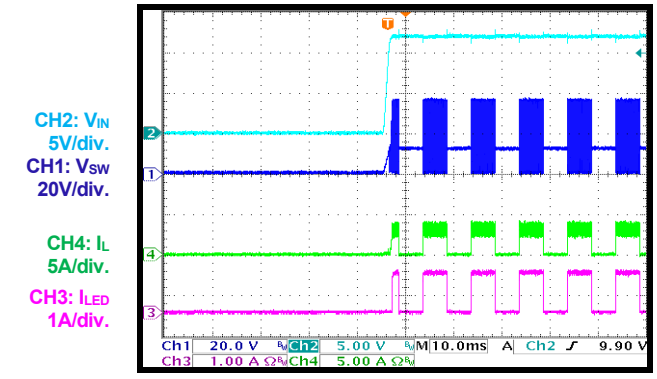


PWM Dimming Steady State

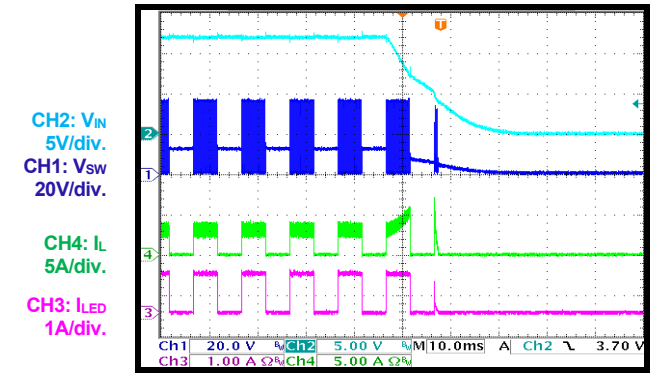
Dimming frequency = 2kHz



PWM Dimming during VIN Start-Up



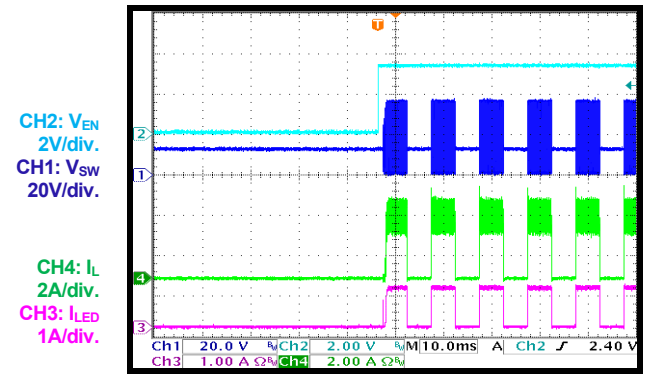
PWM Dimming during VIN Shutdown



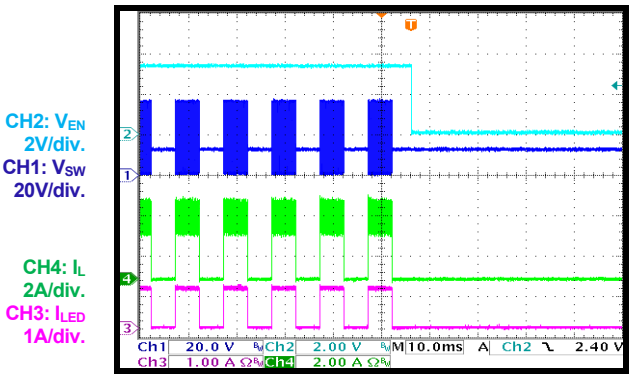
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

PWM Dimming during EN Start-Up

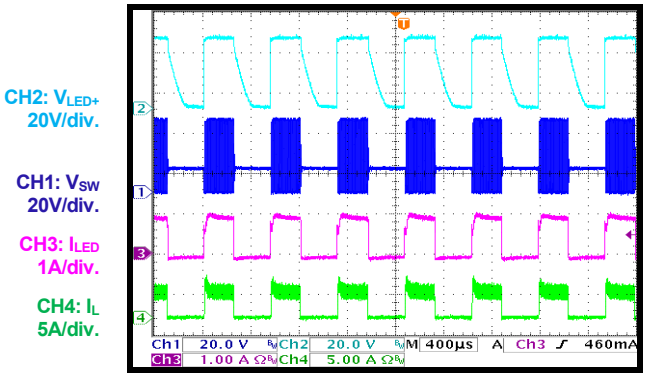


PWM Dimming during Shutdown

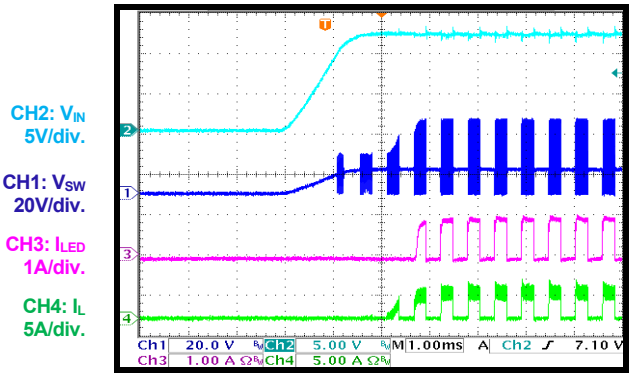


Two-Step Dimming Steady State

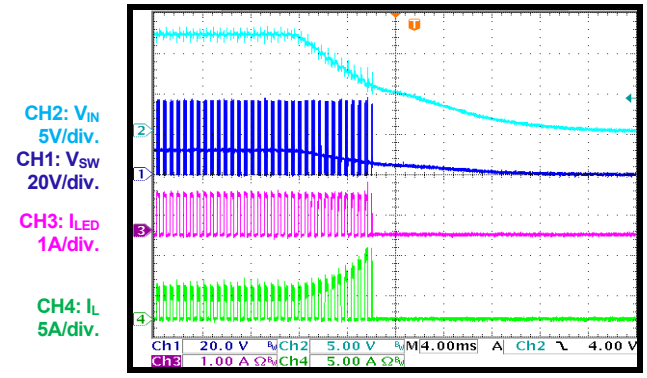
Dimming frequency = 1.8kHz



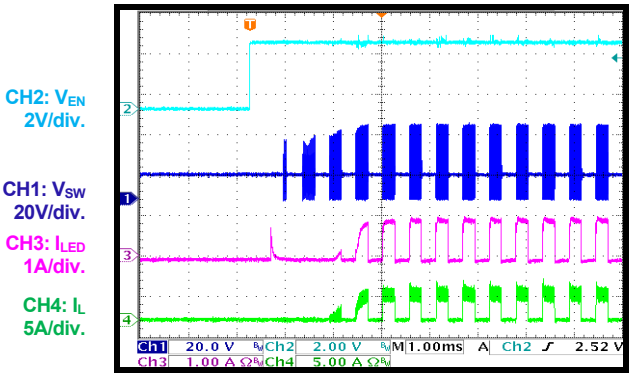
Two-Step Dimming during VIN Start-Up



Two-Step Dimming during VIN Shutdown



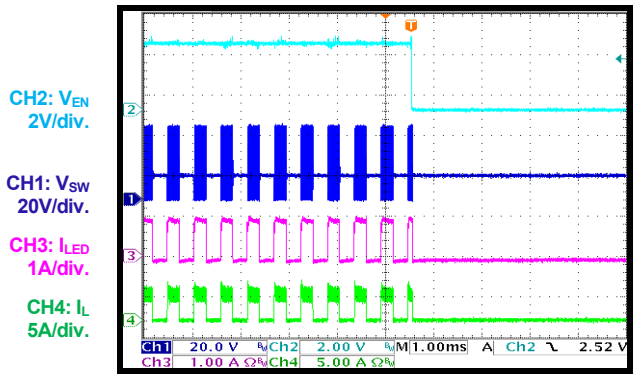
Two-Step Dimming during EN Start-Up



EVB TEST RESULTS *(continued)*

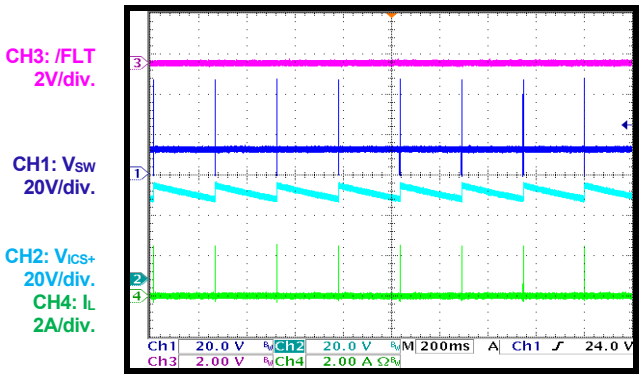
Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

Two-Step Dimming in EN Shutdown



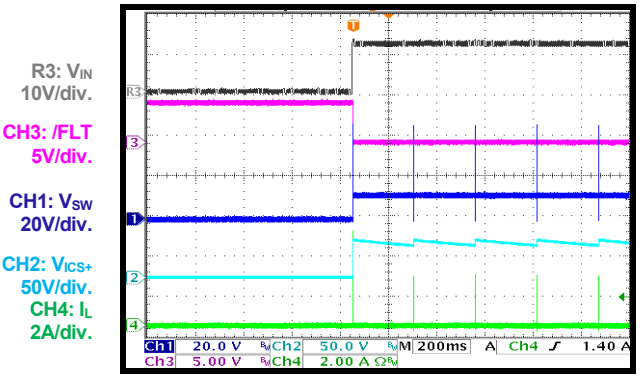
No Dimming

LED open, steady state



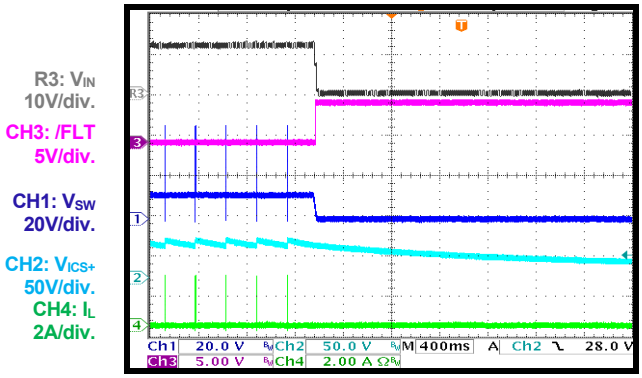
No Dimming during Start-Up

LED open fault



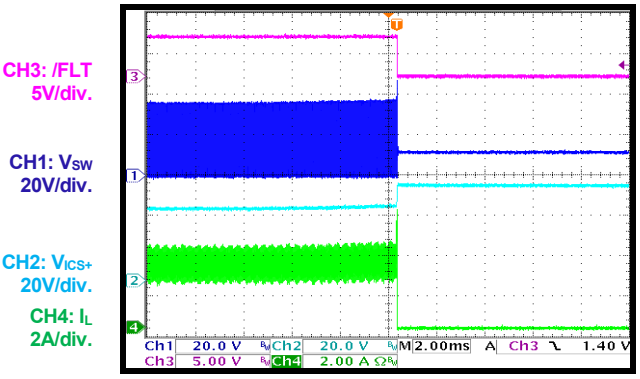
No Dimming during Shutdown

LED open fault



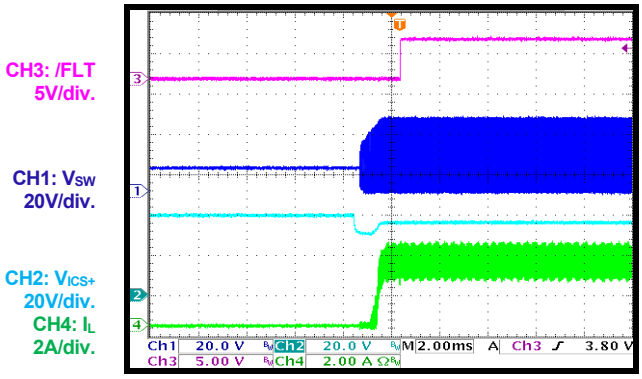
No Dimming

LED open-fault entry



No Dimming

LED open-fault recovery

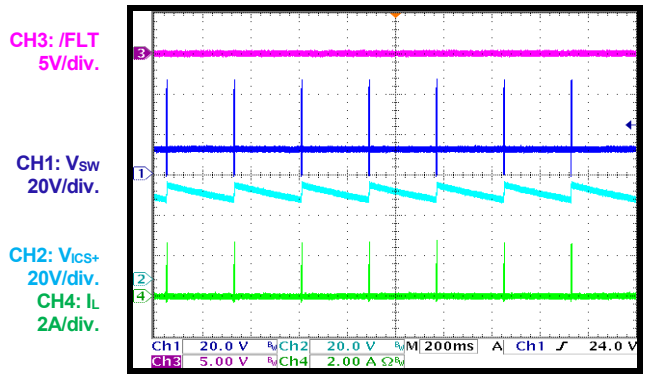


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

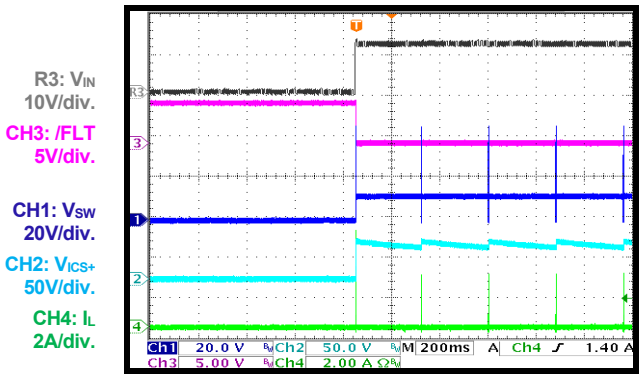
PWM Dimming during Steady State

LED open fault



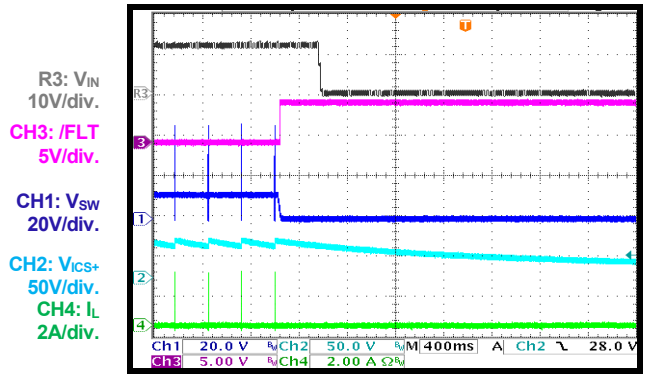
PWM Dimming during Start-Up

LED open fault



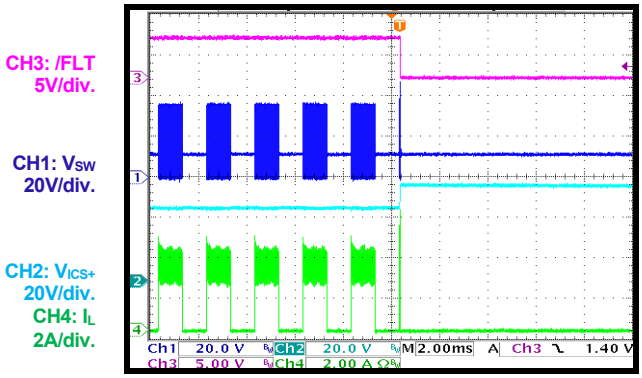
PWM Dimming during Shutdown

LED open fault



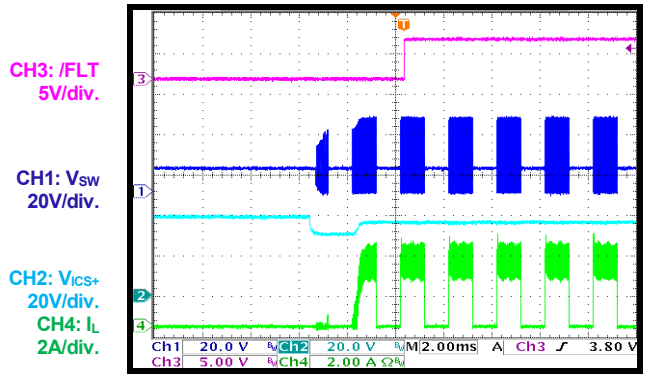
PWM Dimming

LED open-fault entry



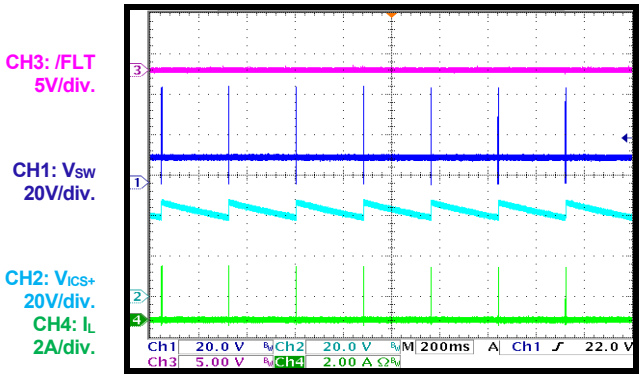
PWM Dimming

LED open-fault recovery



Two-Step Dimming during Steady State

LED open-fault, steady state

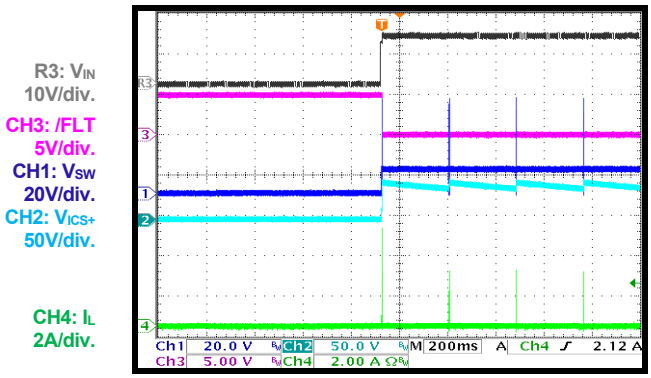


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

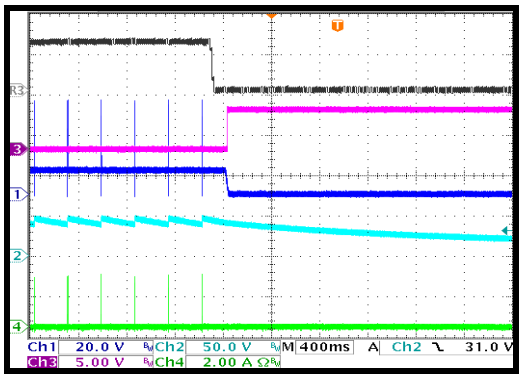
Two-Step Dimming during Start-Up

LED open fault



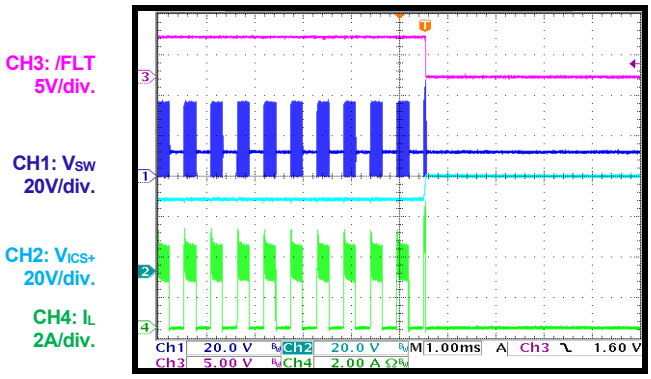
Two-Step Dimming during Shutdown

LED open fault



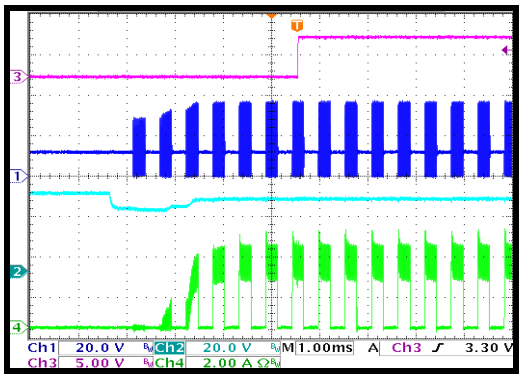
Two-Step Dimming

LED open-fault entry



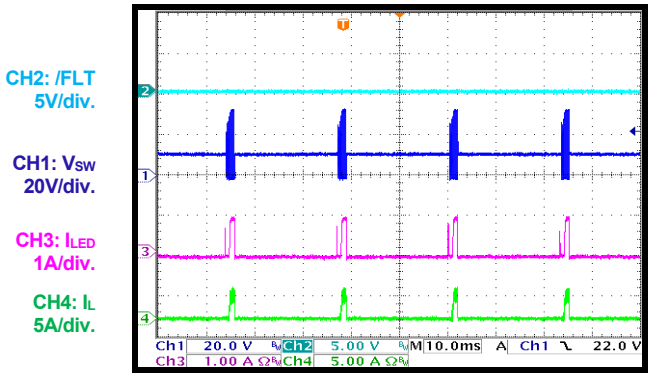
Two-Step Dimming

LED open-fault recovery



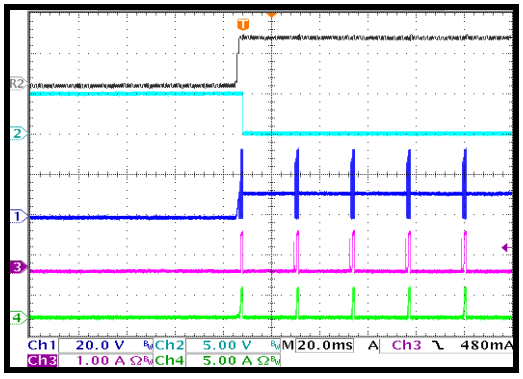
No Dimming during Steady State

One or more LED short fault



No Dimming during Start-Up

One or more LED short fault



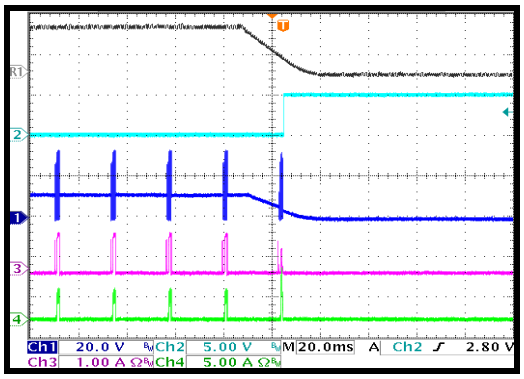
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

No Dimming during Shutdown

One or more LED short faults

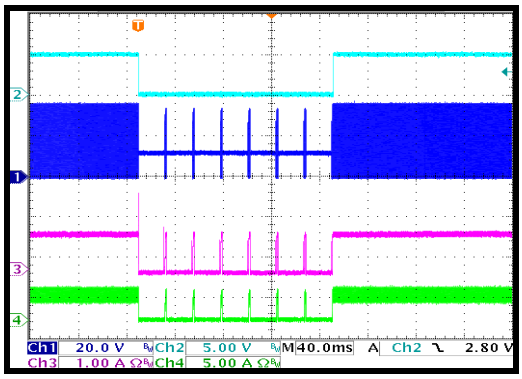
R1: V_{IN} 10V/div.
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 1A/div.
CH4: I_L 5A/div.



No Dimming

One or more LED short faults entry and recovery

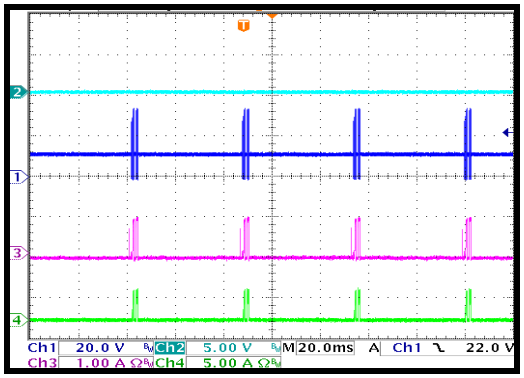
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 1A/div.
CH4: I_L 5A/div.



PWM Dimming during Steady State

One or more LED short faults

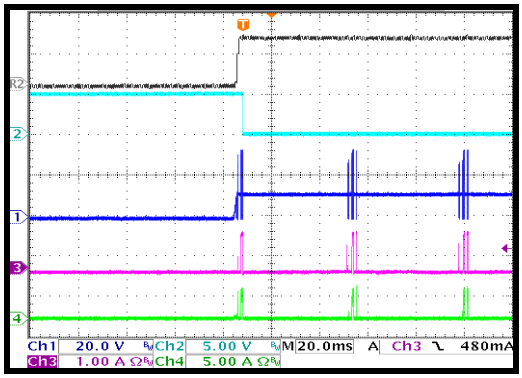
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 1A/div.
CH4: I_L 5A/div.



PWM Dimming during Start-Up

One or more LED short faults

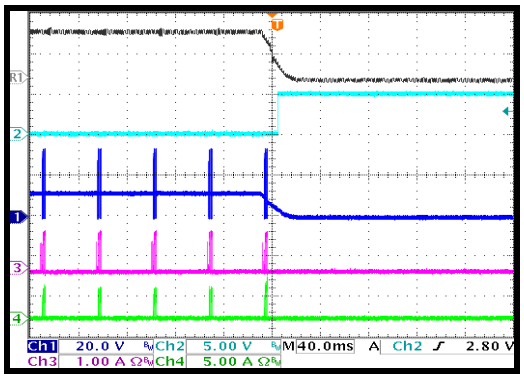
R2: V_{IN} 10V/div.
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 1A/div.
CH4: I_L 5A/div.



PWM Dimming during Shutdown

One or more LED short faults

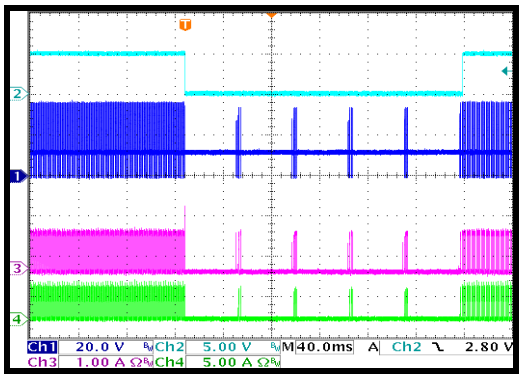
R1: V_{IN} 10V/div.
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 1A/div.
CH4: I_L 5A/div.



PWM Dimming

One or more LED short faults entry and recovery

CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 1A/div.
CH4: I_L 5A/div.

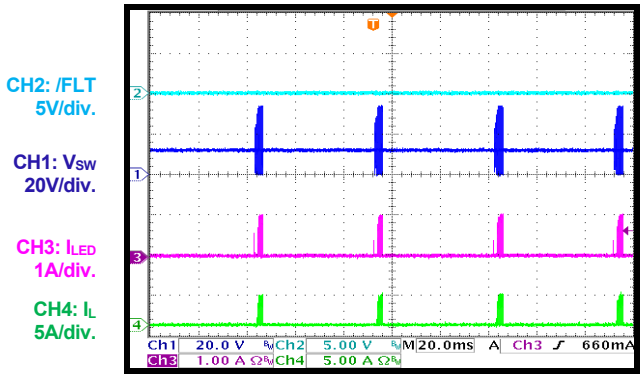


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

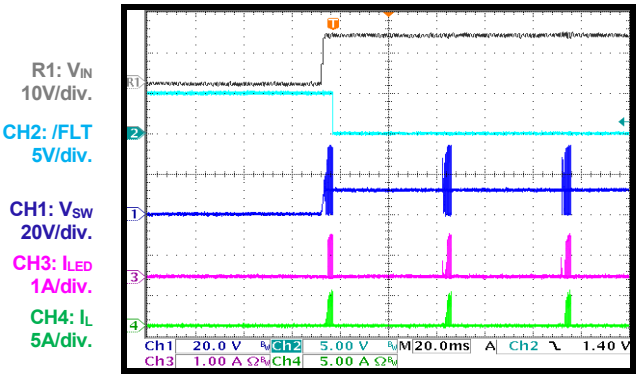
Two-Step Dimming during Steady State

One or more LED short faults



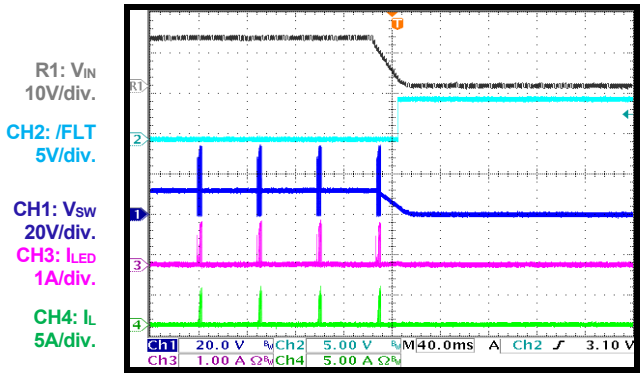
Two-Step Dimming during Start-Up

One or more LED short faults



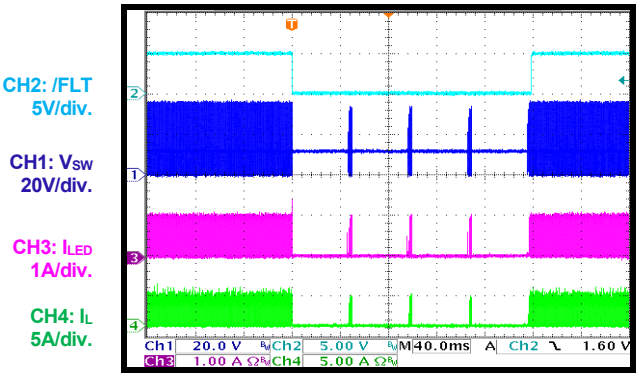
Two-Step Dimming during Shutdown

One or more LED short faults



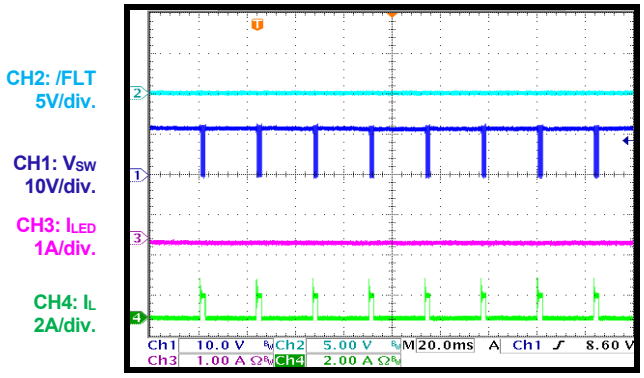
Two-Step Dimming

One or more LED short faults entry and recovery



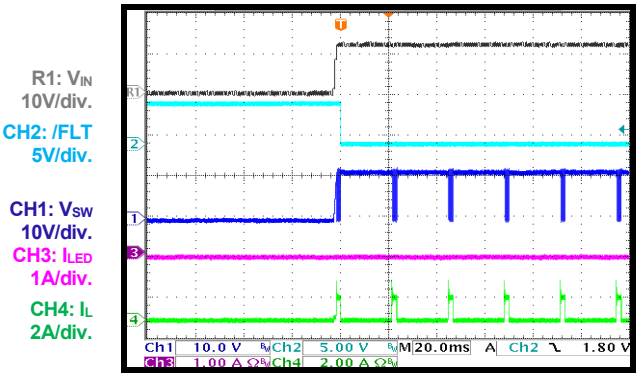
No Dimming during Steady State

LED+ short to LED-



No Dimming during Start-Up

LED+ short to LED-

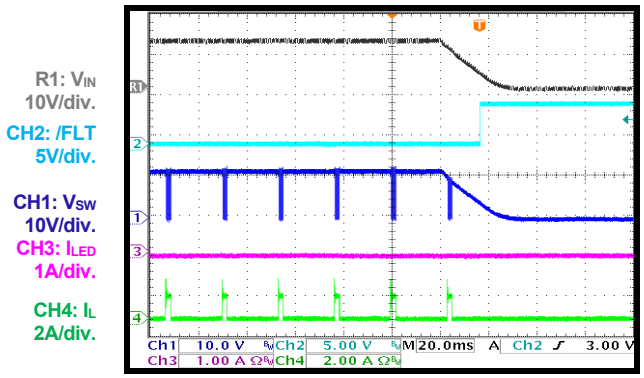


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

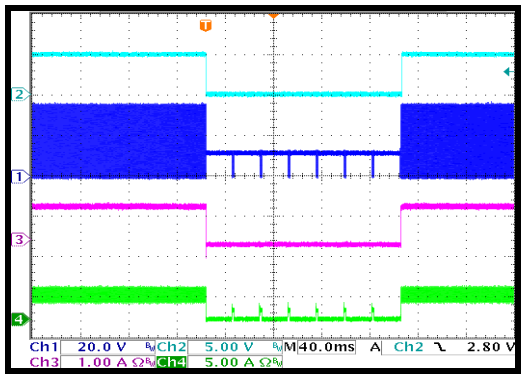
No Dimming during Shutdown

LED+ to LED- short



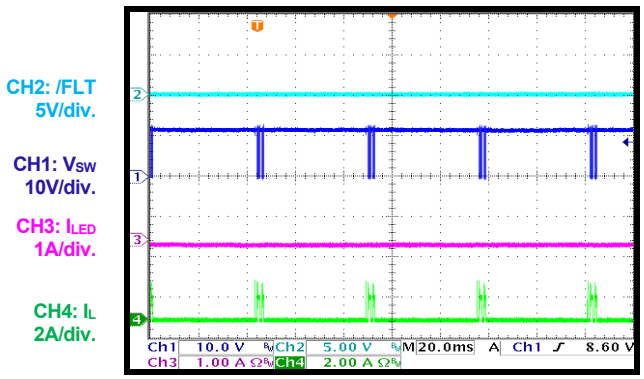
No Dimming

LED+ to LED- short entry and recovery



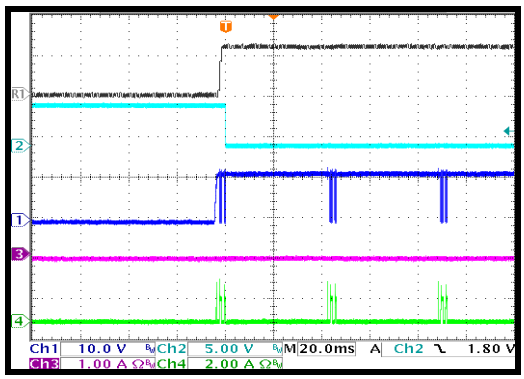
PWM Dimming during Steady State

LED+ to LED- short, steady state



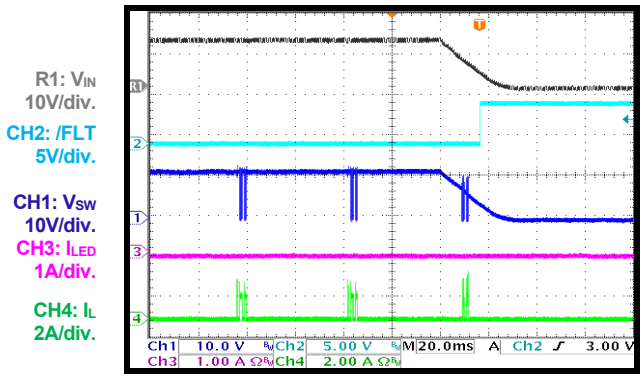
PWM Dimming during Start-Up

LED+ to LED- short



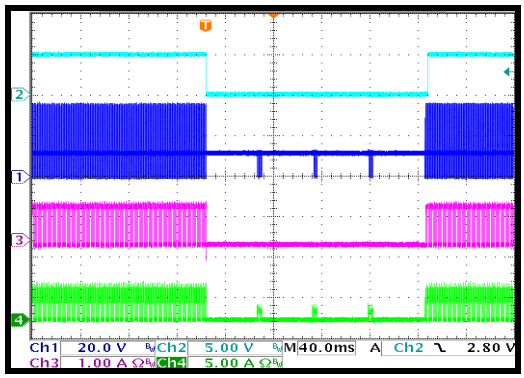
PWM Dimming during Shutdown

LED+ to LED- short



PWM Dimming

LED+ to LED- short entry and recovery

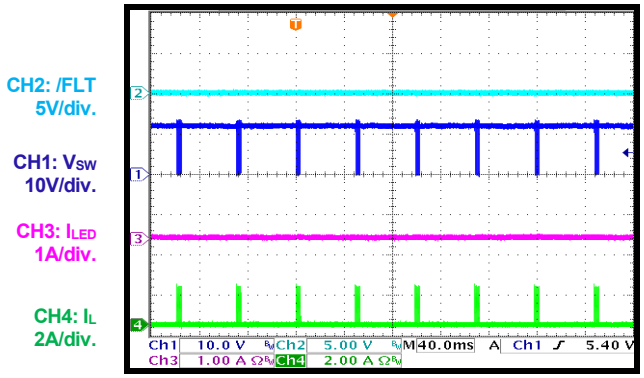


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, boost mode, 12 LEDs, V_{LED} = 36V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

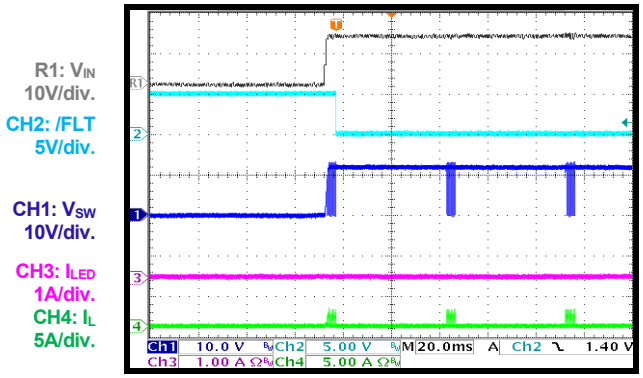
Two-Step Dimming during Steady State

LED+ to LED- short



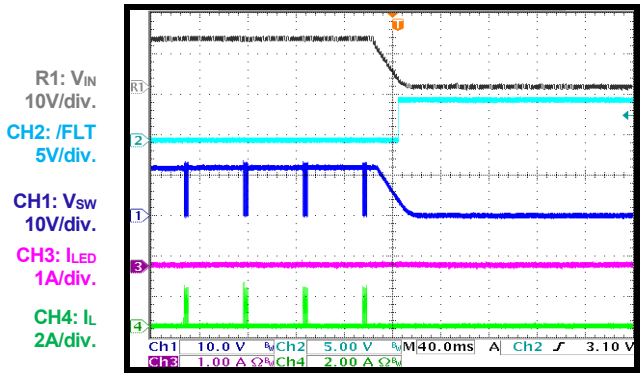
Two-Step Dimming during Start-Up

LED+ to LED- short, start-up



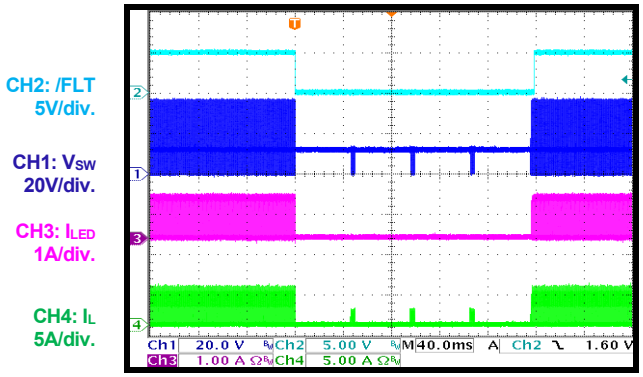
Two-Step Dimming during Shutdown

LED+ to LED- short



Two-Step Dimming

LED+ to LED- short entry and recovery

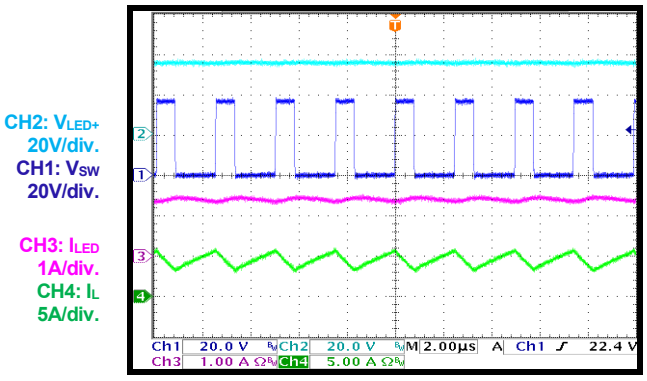


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

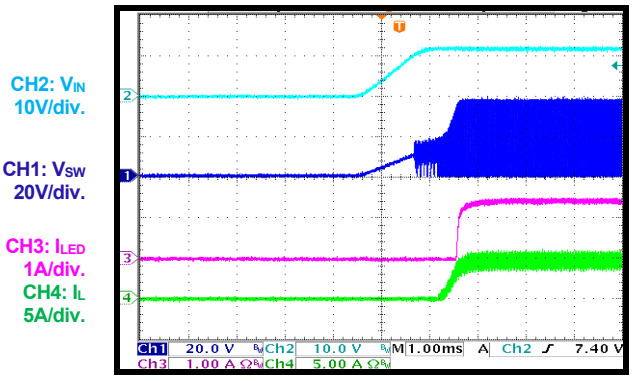
Steady State

I_{LED} = 1.5A



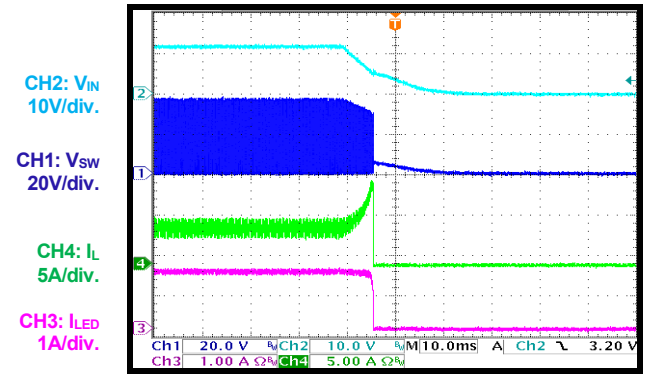
Start-Up through VIN

I_{LED} = 1.5A



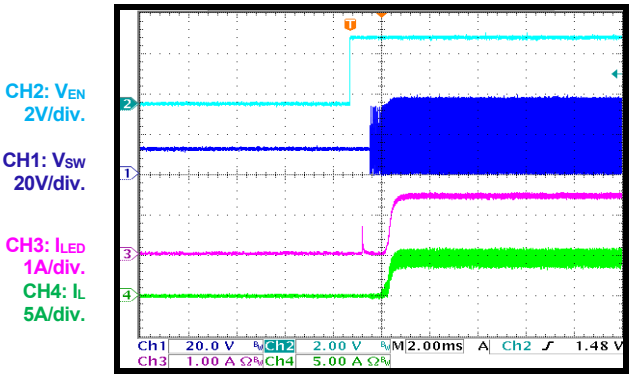
Shutdown through VIN

I_{LED} = 1.5A



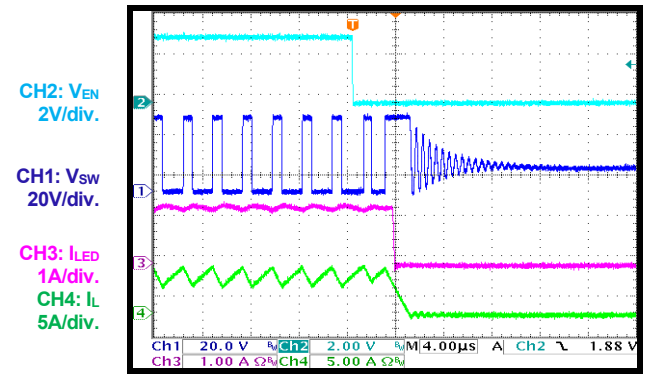
Start-Up through EN

I_{LED} = 1.5A



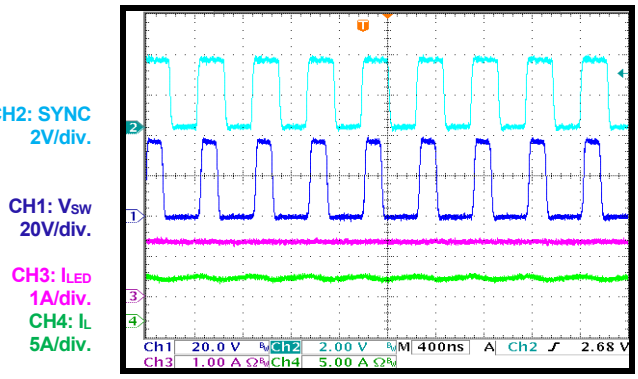
Shutdown through EN

I_{LED} = 1.5A



SYNC Function Steady State

SYNC frequency = 2.2MHz

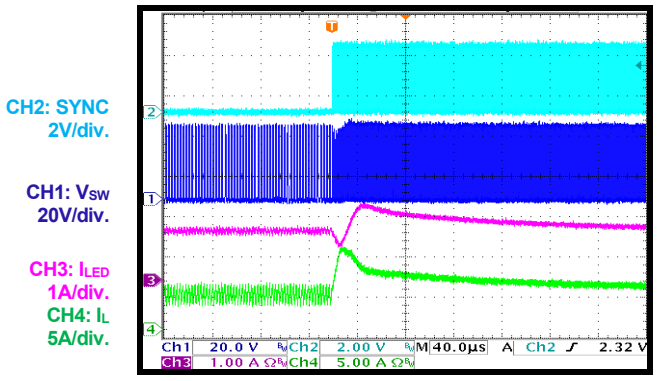


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

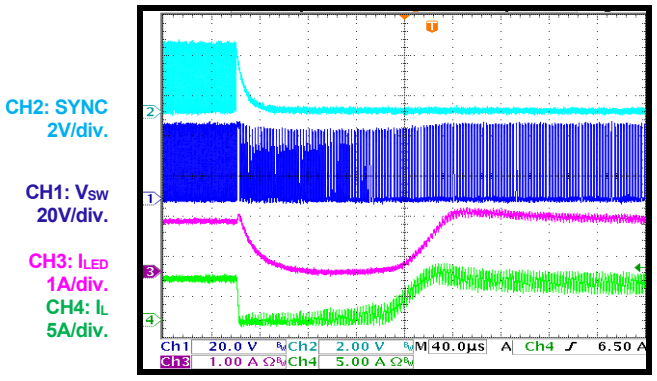
SYNC IN

SYNC frequency = 2.2MHz



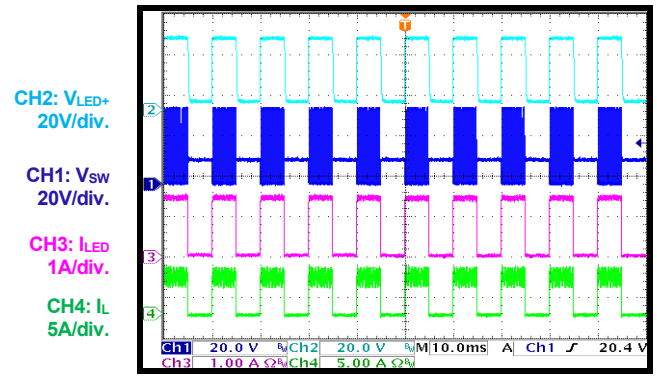
SYNC OUT

SYNC frequency = 2.2MHz



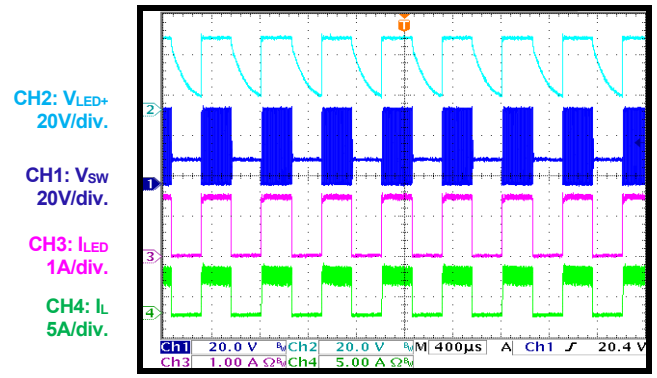
PWM Dimming Steady State

Dimming frequency = 100Hz

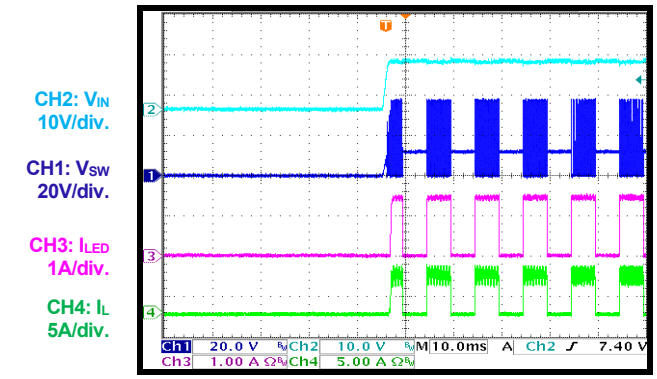


PWM Dimming Steady State

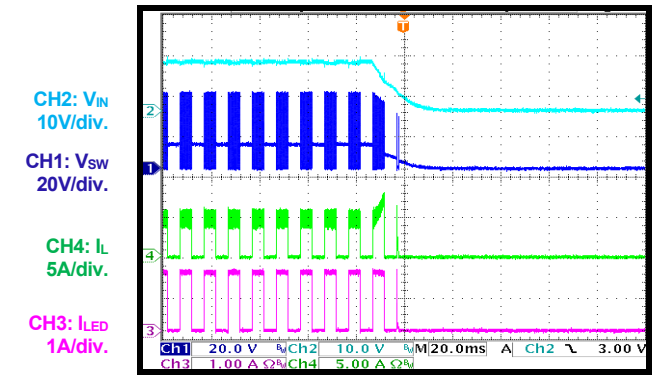
Dimming frequency = 2kHz



PWM Dimming during VIN Start-Up



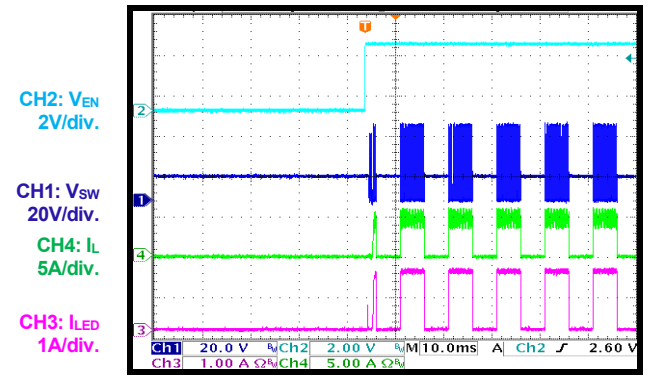
PWM Dimming during VIN Shutdown



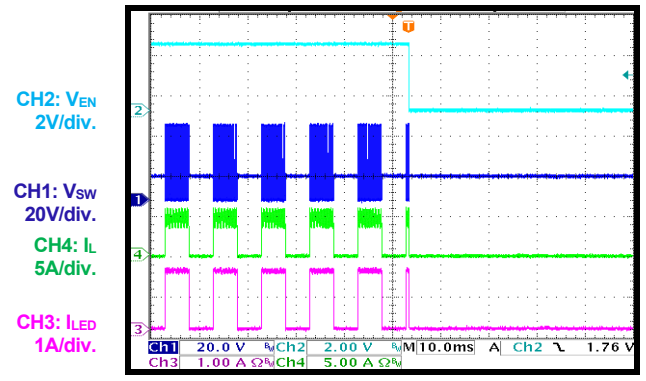
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

PWM Dimming during EN Start-Up

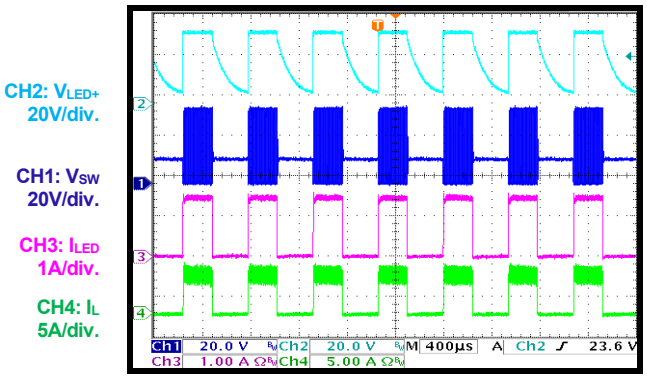


PWM Dimming during EN Shutdown

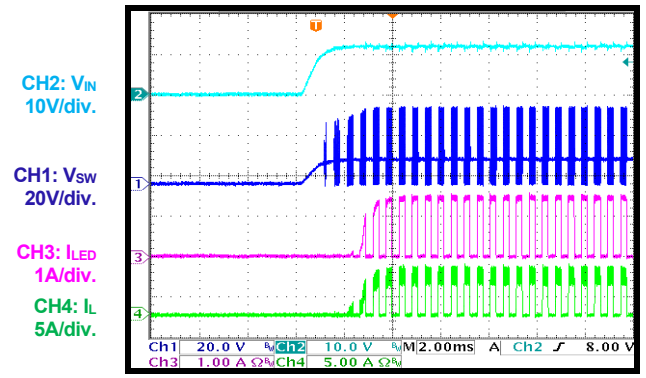


Two-Step Dimming Steady State

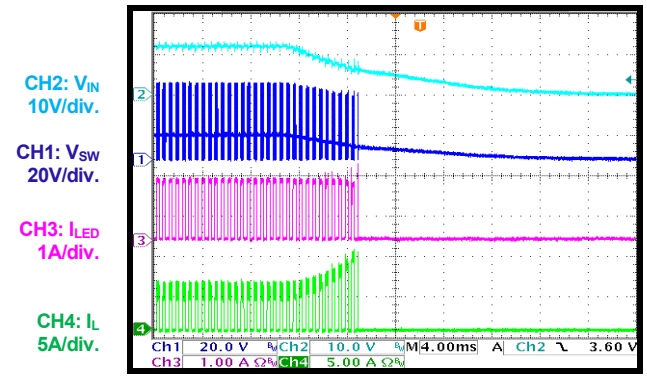
Dimming frequency = 1.8kHz



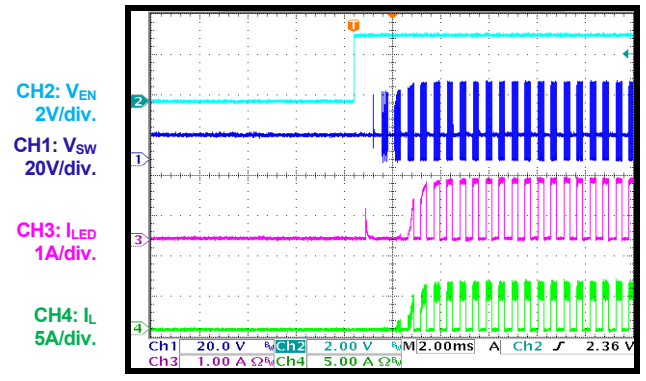
Two-Step Dimming during VIN Start-Up



Two-Step Dimming during VIN Shutdown



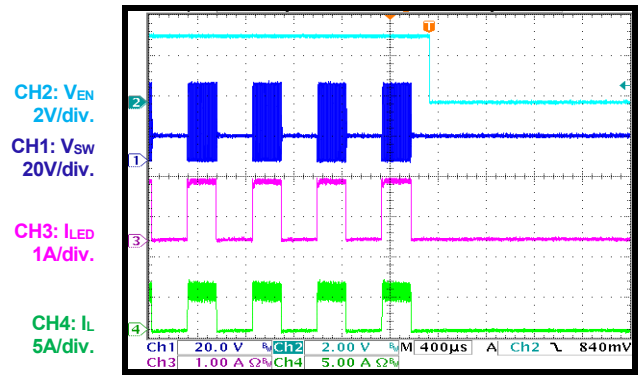
Two-Step Dimming during EN Start-Up



EVB TEST RESULTS *(continued)*

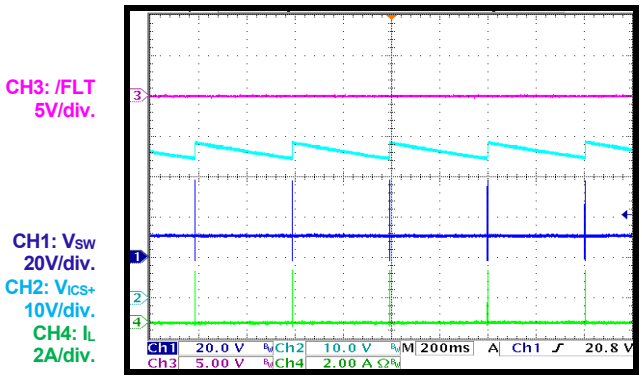
Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

Two-Step Dimming during EN Shutdown



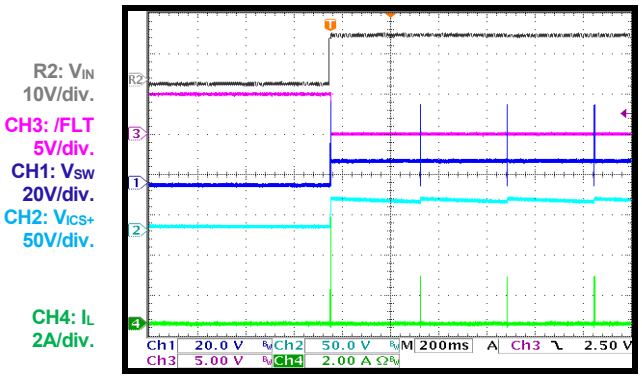
No Dimming during Steady State

LED open fault



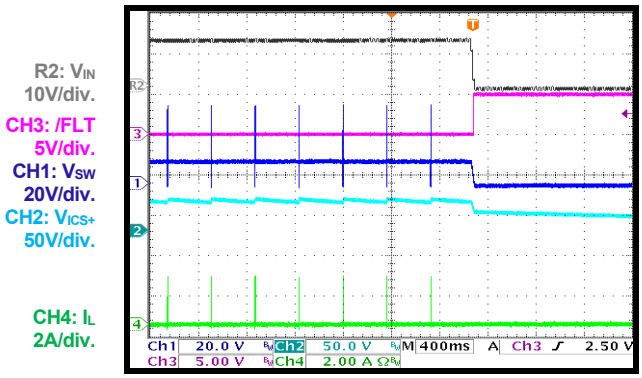
No Dimming during Start-Up

LED open fault



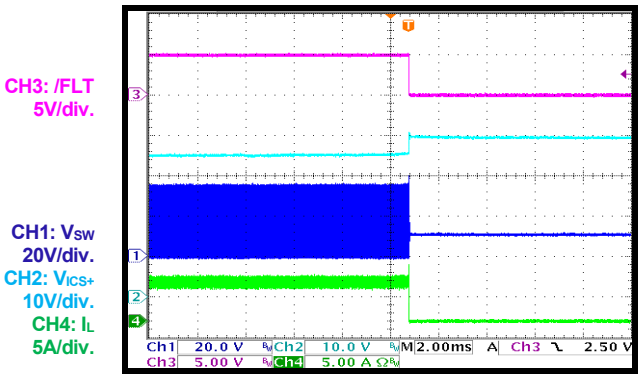
No Dimming during Shutdown

LED open fault



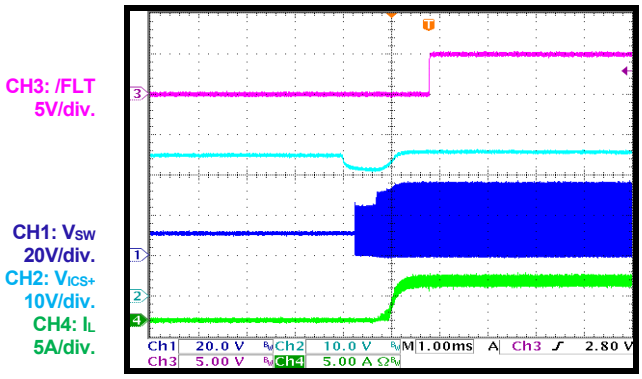
No Dimming

LED open-fault entry



No Dimming

LED open-fault recovery

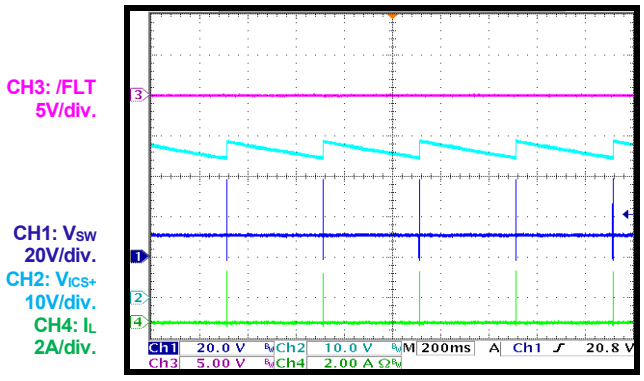


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

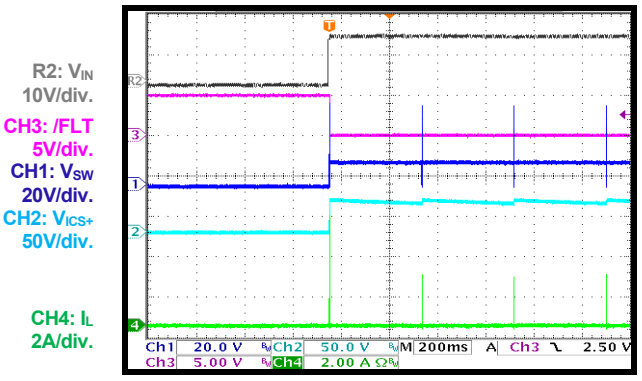
PWM Dimming during Steady State

LED open fault



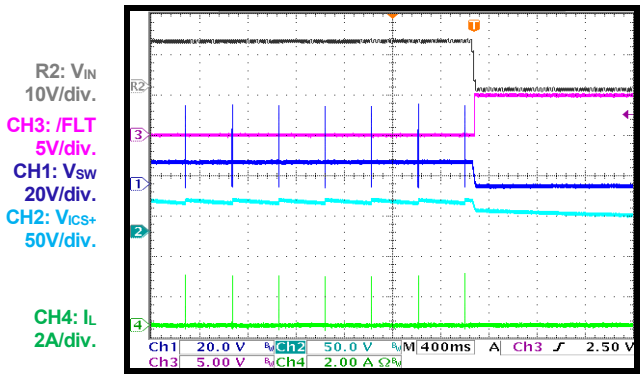
PWM Dimming during Start-Up

LED open fault



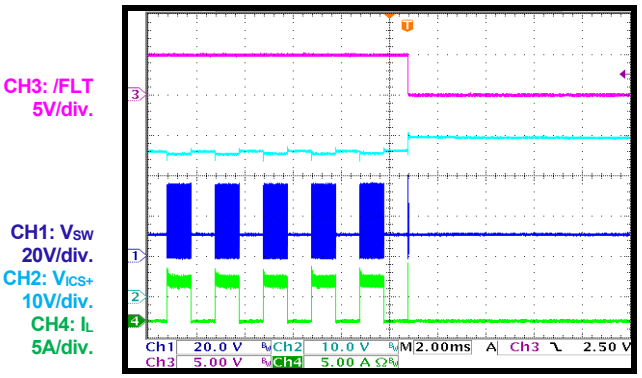
PWM Dimming during Shutdown

LED open fault



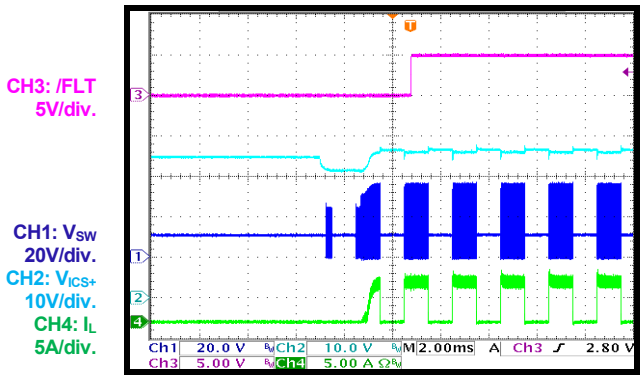
PWM Dimming

LED open-fault entry



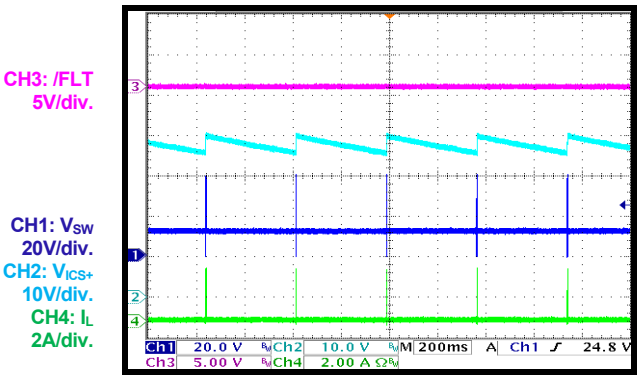
PWM Dimming

LED open-fault recovery



Two-Step Dimming during Steady State

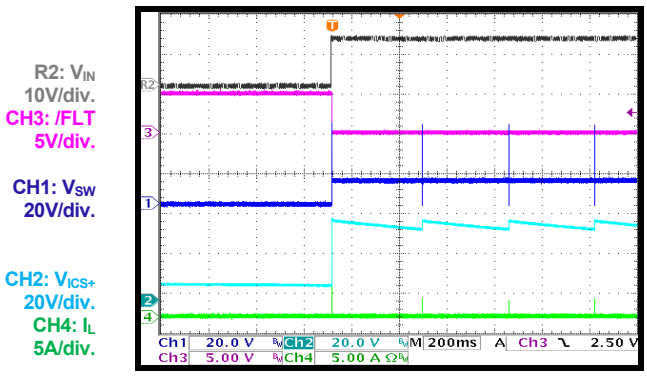
LED open fault



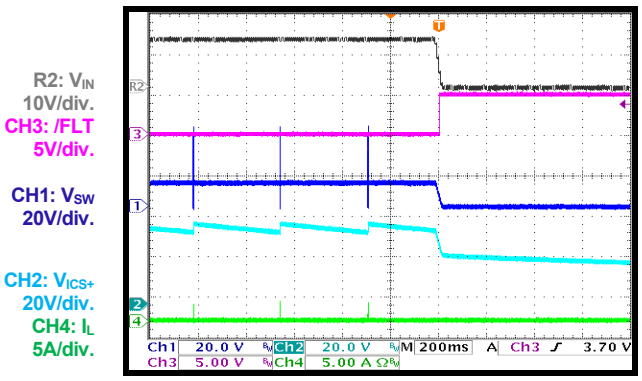
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

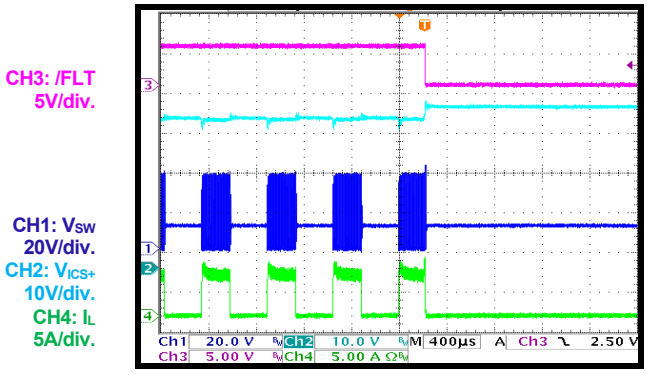
Two-Step Dimming during Start-Up
LED open fault



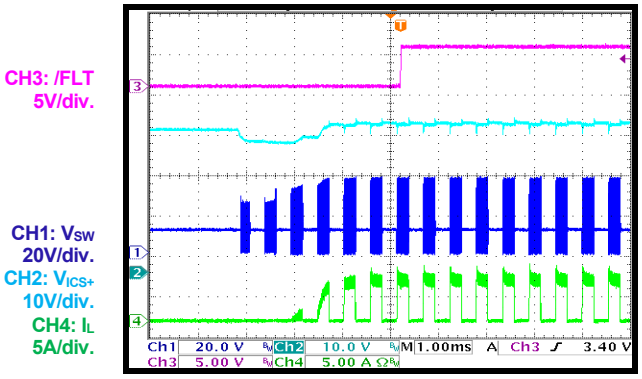
Two-Step Dimming during Shutdown
LED open fault



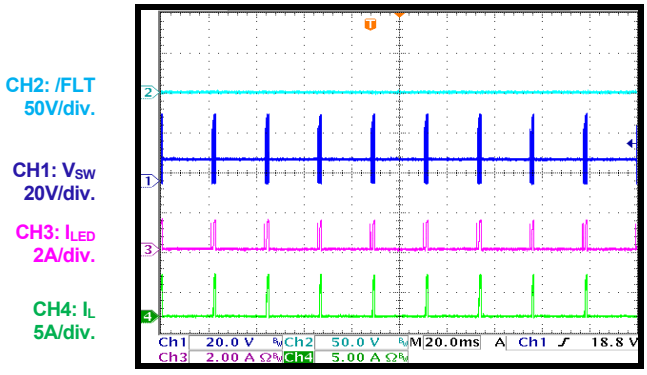
Two-Step Dimming
LED open-fault entry



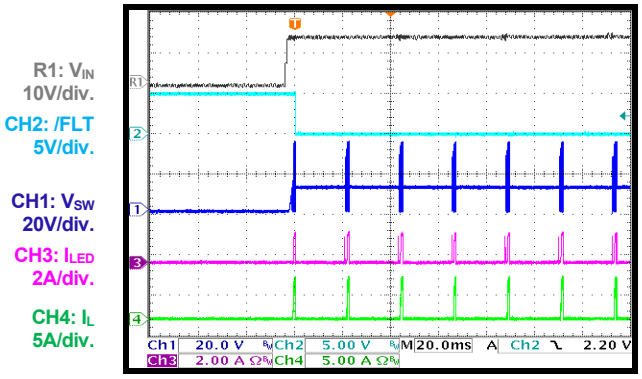
Two-Step Dimming
LED open-fault recovery



No Dimming during Steady State
One or more LED short faults



No Dimming during Start-Up
One or more LED short faults



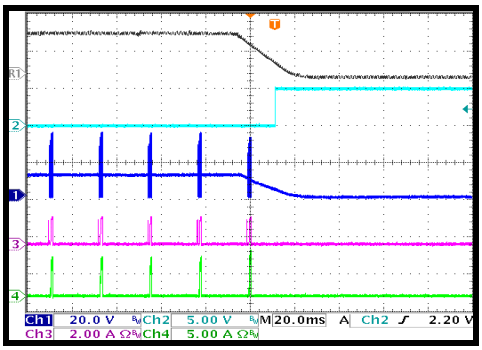
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

No Dimming during Shutdown

One or more LED short faults

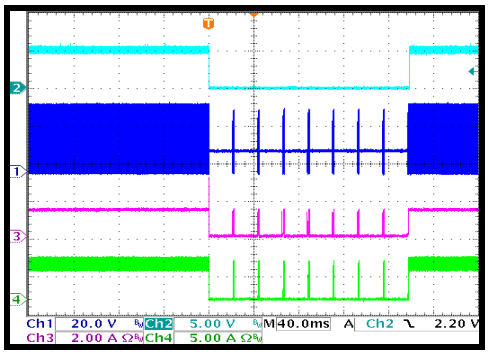
R1: V_{IN} 10V/div.
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 2A/div.
CH4: I_L 5A/div.



No Dimming

One or more LED short faults entry and recovery

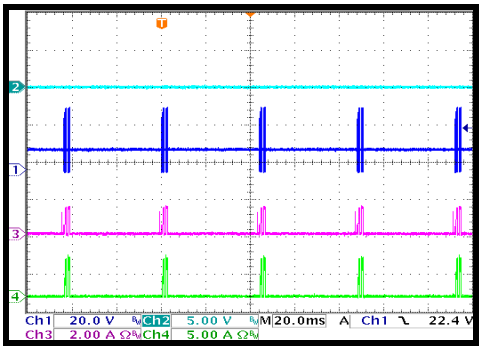
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 2A/div.
CH4: I_L 5A/div.



PWM Dimming during Steady State

One or more LED short faults

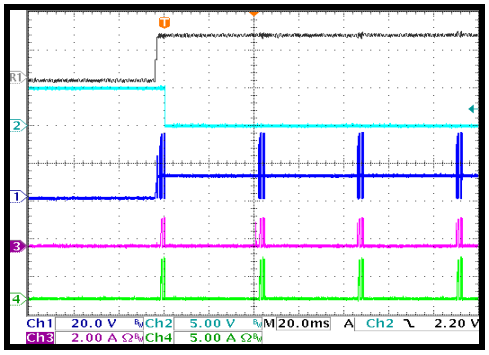
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 2A/div.
CH4: I_L 5A/div.



PWM Dimming during Start-Up

One or more LED short faults

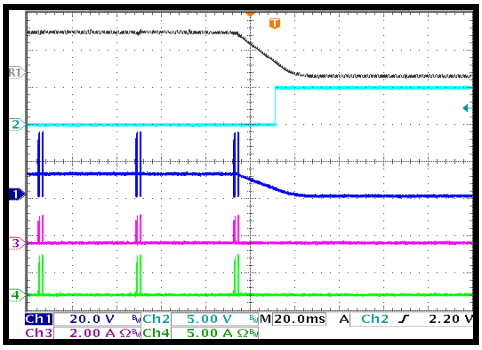
R1: V_{IN} 10V/div.
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 2A/div.
CH4: I_L 5A/div.



PWM Dimming during Shutdown

One or more LED short faults

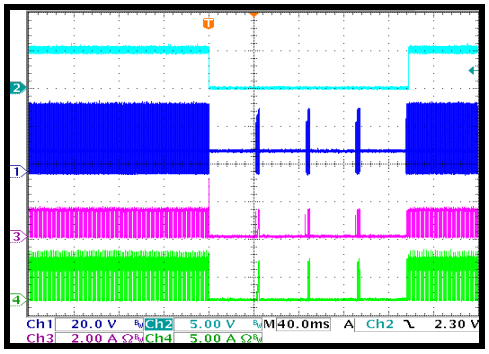
R1: V_{IN} 10V/div.
CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 2A/div.
CH4: I_L 5A/div.



PWM Dimming

One or more LED short faults entry and recovery

CH2: /FLT 5V/div.
CH1: V_{SW} 20V/div.
CH3: I_{LED} 2A/div.
CH4: I_L 5A/div.

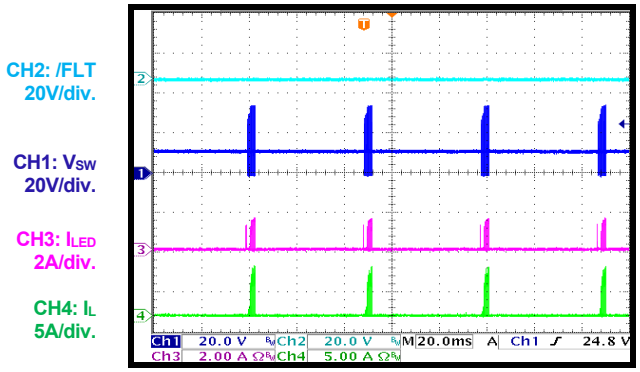


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

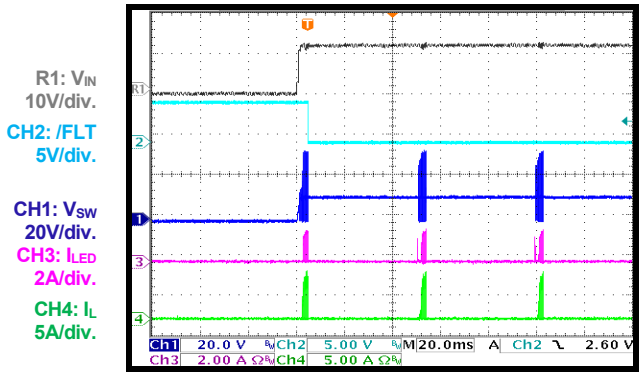
Two-Step Dimming during Steady State

One or more LED short faults



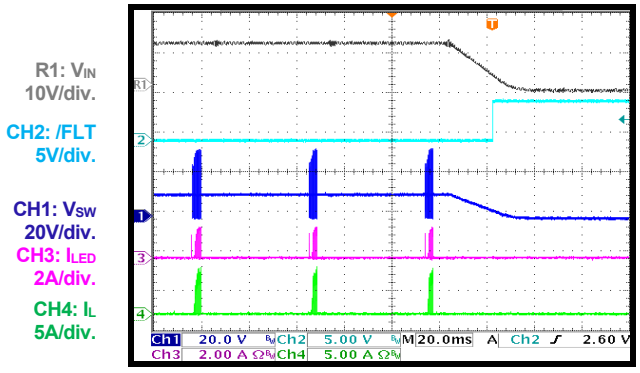
Two-Step Dimming during Start-Up

One or more LED short faults



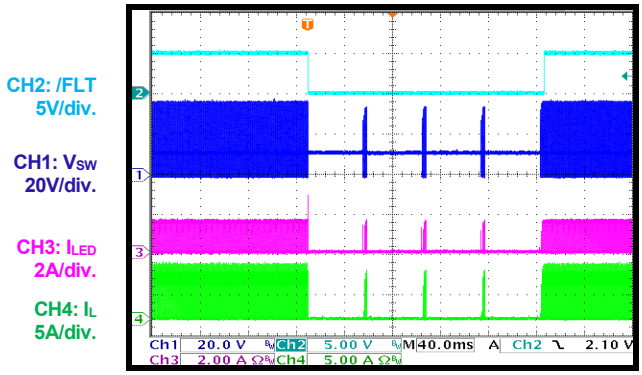
Two-Step Dimming during Shutdown

One or more LED short faults



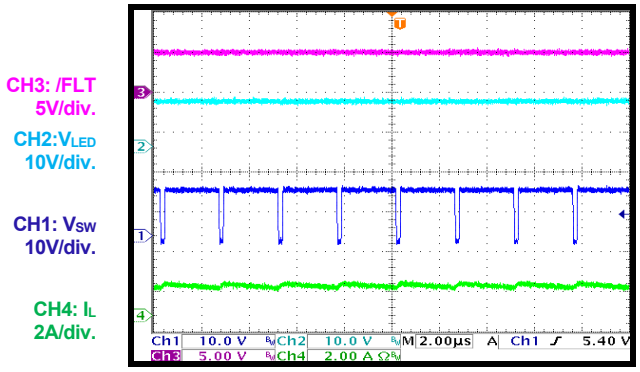
Two-Step Dimming

One or more LED short faults entry and recovery



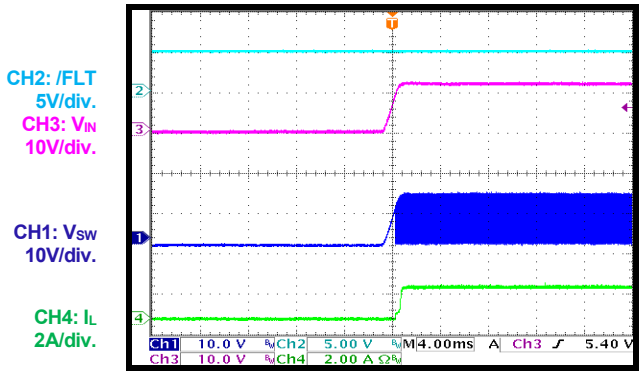
No Dimming during Steady State

LED+ to LED- short



No Dimming during Start-Up

LED+ to LED- short

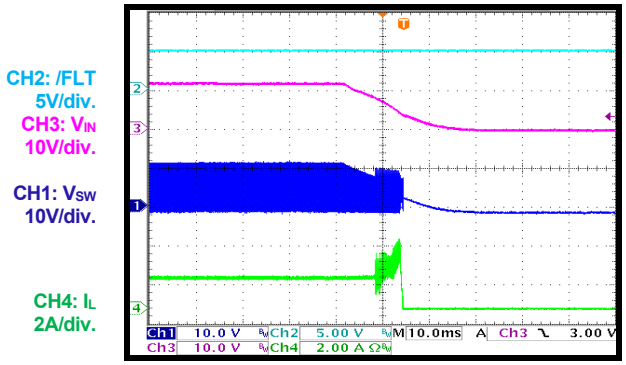


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

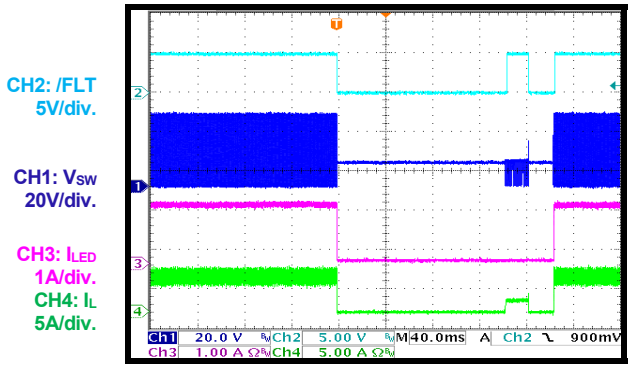
No Dimming during Shutdown

LED+ to LED- short



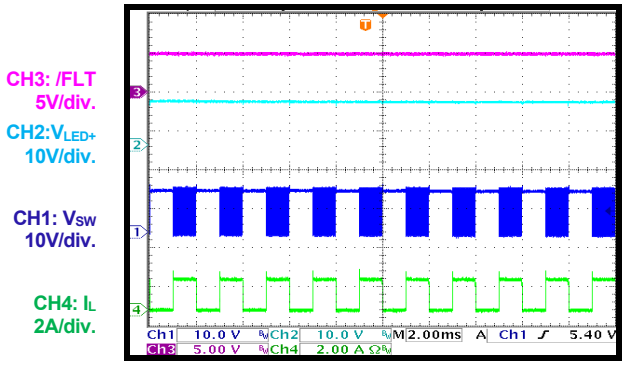
No Dimming

LED+ to LED- short entry and recovery



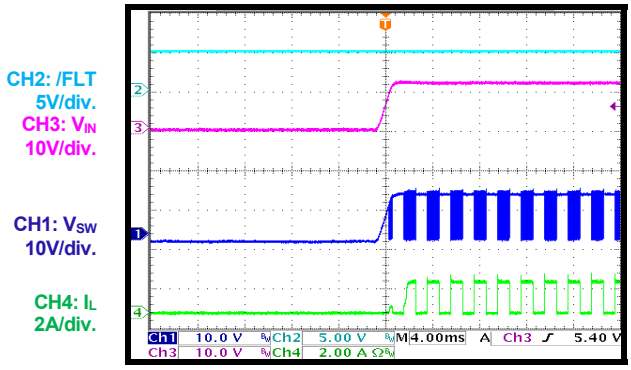
PWM Dimming during Steady State

LED+ to LED- short



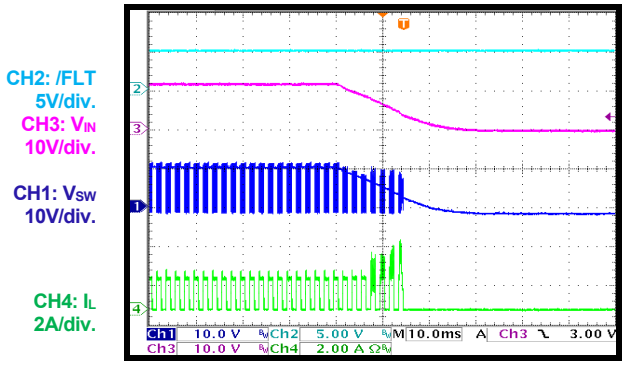
PWM Dimming during Start-Up

LED+ to LED- short



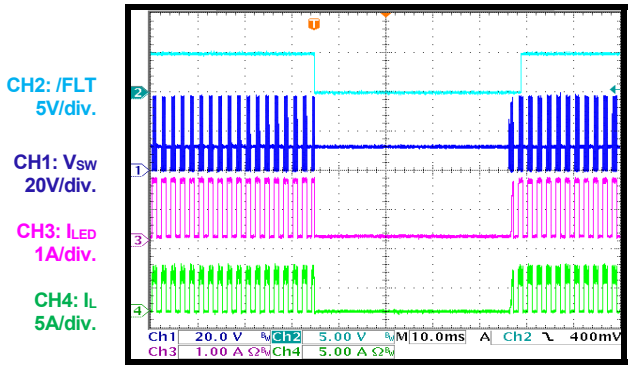
PWM Dimming during Shutdown

LED+ to LED- short



PWM Dimming

LED+ to LED- short entry and recovery

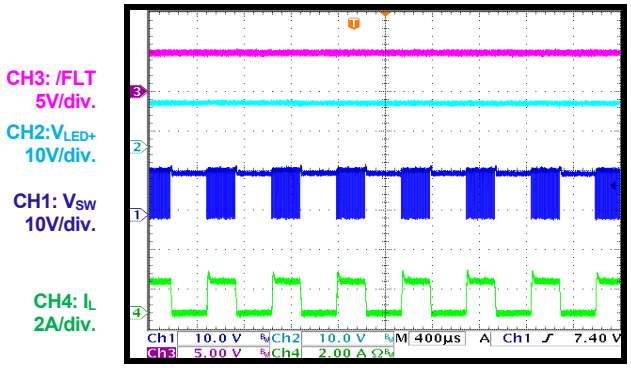


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

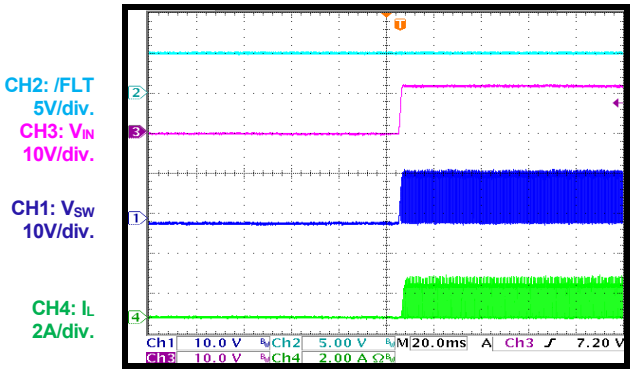
Two-Step Dimming during Steady State

LED+ to LED- short



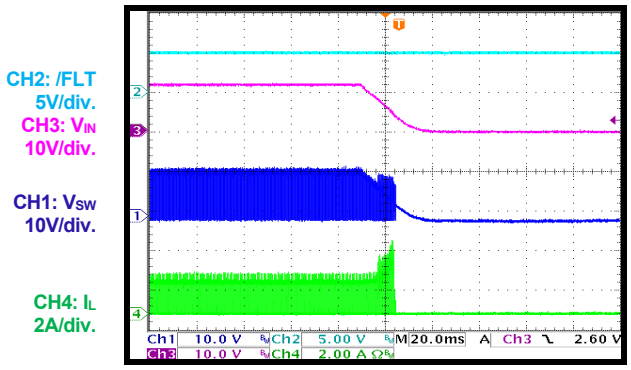
Two-Step Dimming during Start-Up

LED+ to LED- short



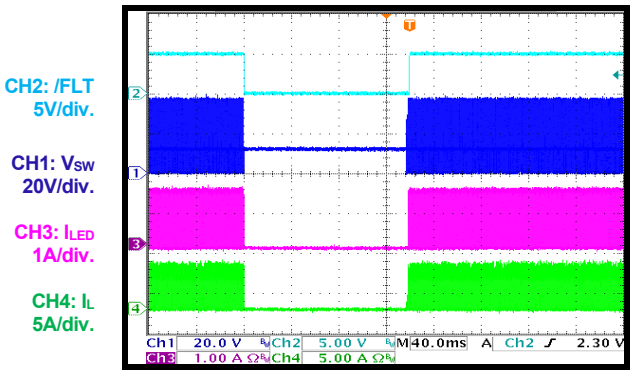
Two-Step Dimming during Shutdown

LED+ to LED- short



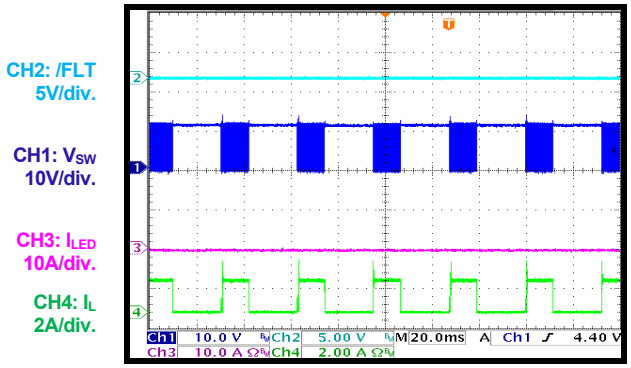
Two-Step Dimming

LED+ to LED- short entry and recovery



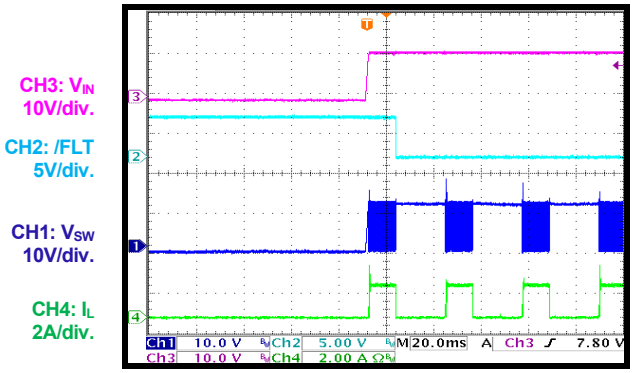
No Dimming during Steady State

LED+ to PGND short



No Dimming during Start-Up

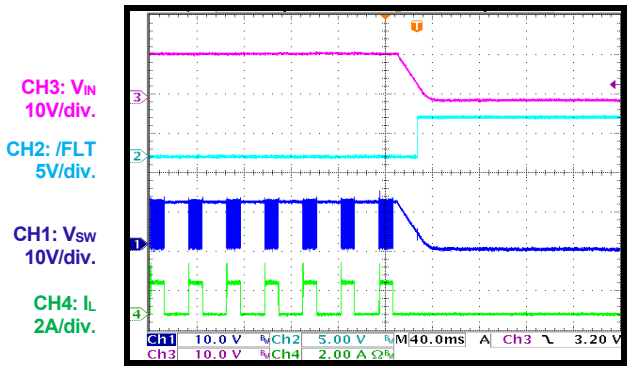
LED+ to PGND short



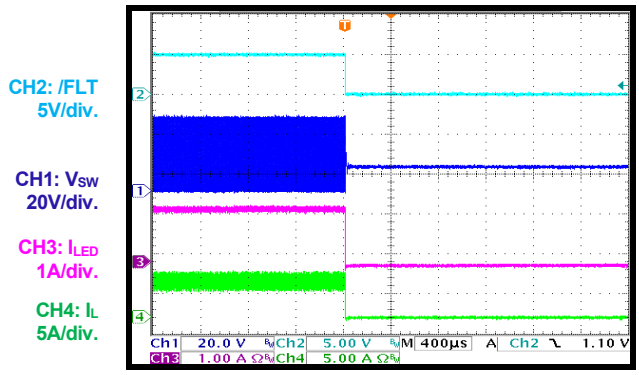
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

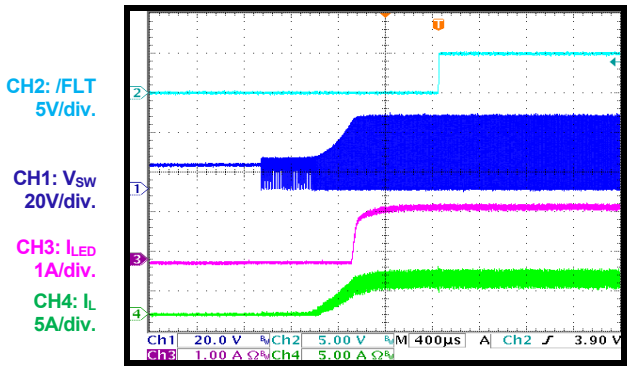
No Dimming during Shutdown
LED+ to PGND short



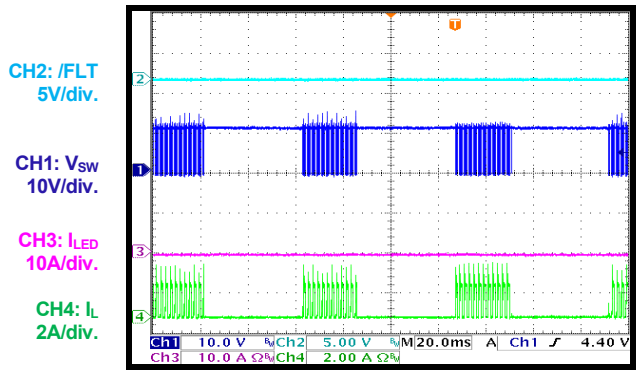
No Dimming
LED+ to PGND short entry



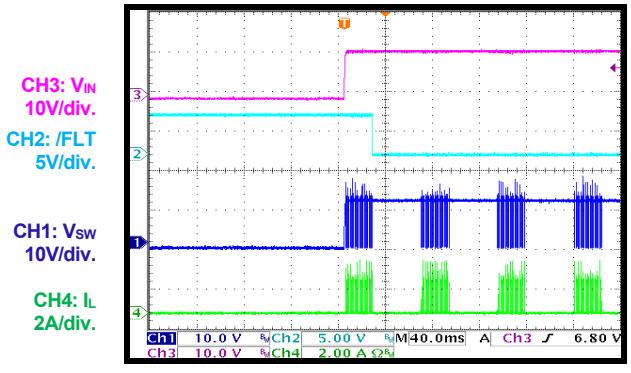
No Dimming
LED+ to PGND short recovery



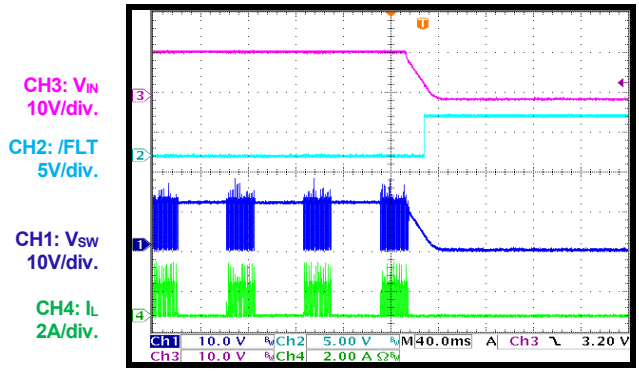
PWM Dimming during Steady State
LED+ to PGND short



PWM Dimming during Start-Up
LED+ to PGND short



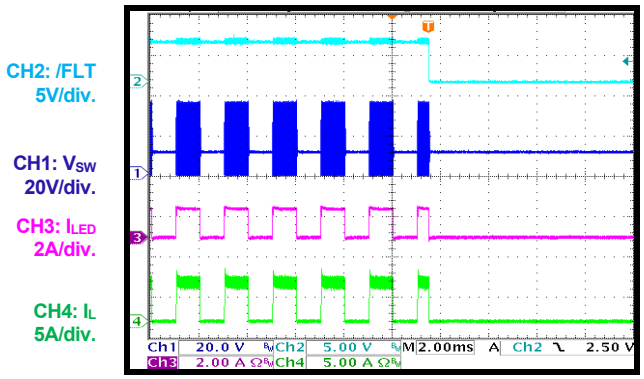
PWM Dimming during Shutdown
LED+ to PGND short



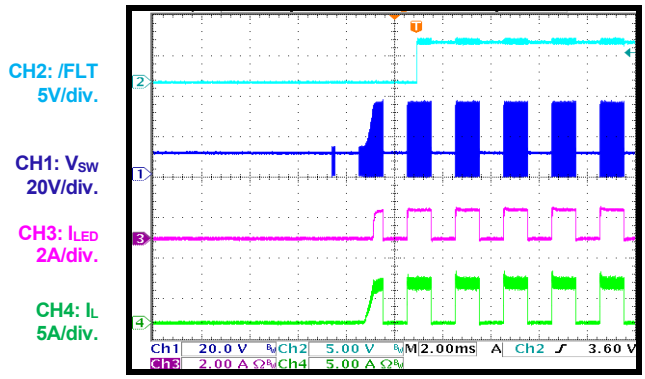
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10µH, T_A = 25°C, unless otherwise noted.

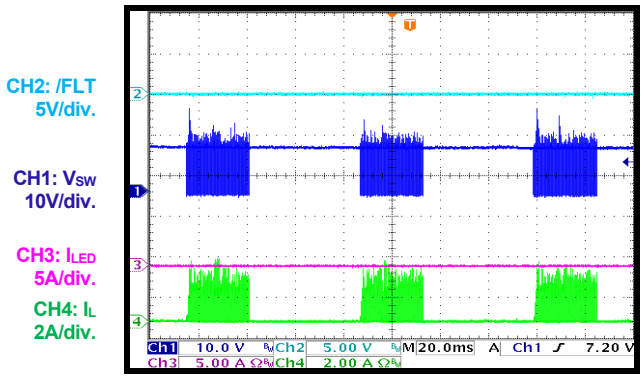
PWM Dimming
LED+ to PGND short entry



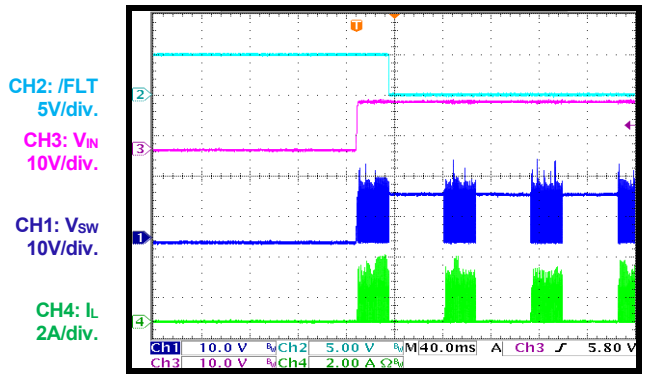
PWM Dimming
LED+ to PGND short recovery



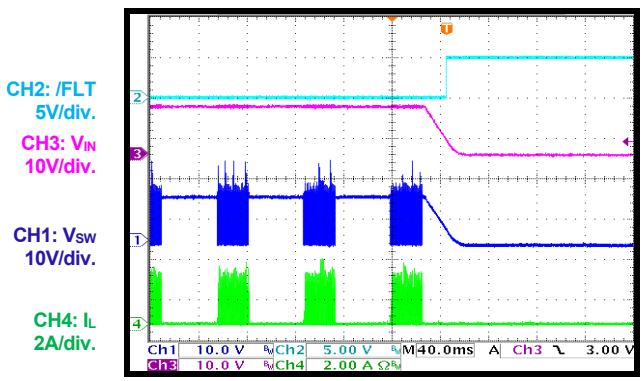
Two-Step Dimming during Steady State
LED+ to PGND short



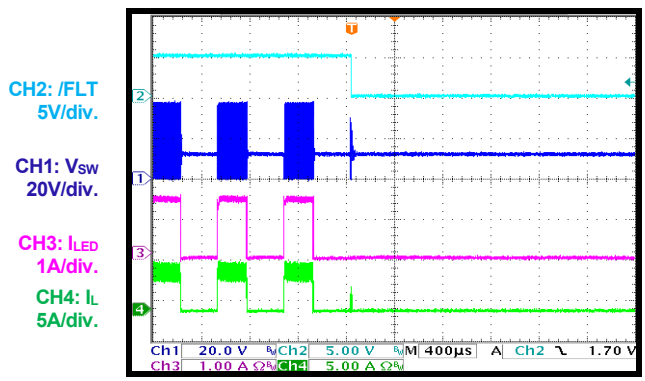
Two-Step Dimming during Start-Up
LED+ to PGND short



Two-Step Dimming during Shutdown
LED+ to PGND short



Two-Step Dimming
LED+ to PGND short entry

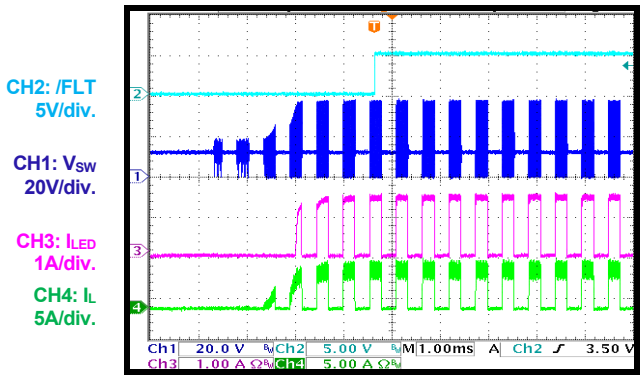


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board, buck-boost mode, 8 LEDs, V_{LED} = 24V, V_{IN} = 12V, f_{SW} = 410kHz, L = 10μH, T_A = 25°C, unless otherwise noted.

Two-Step Dimming

LED+ to PGND short recovery



PCB LAYOUT

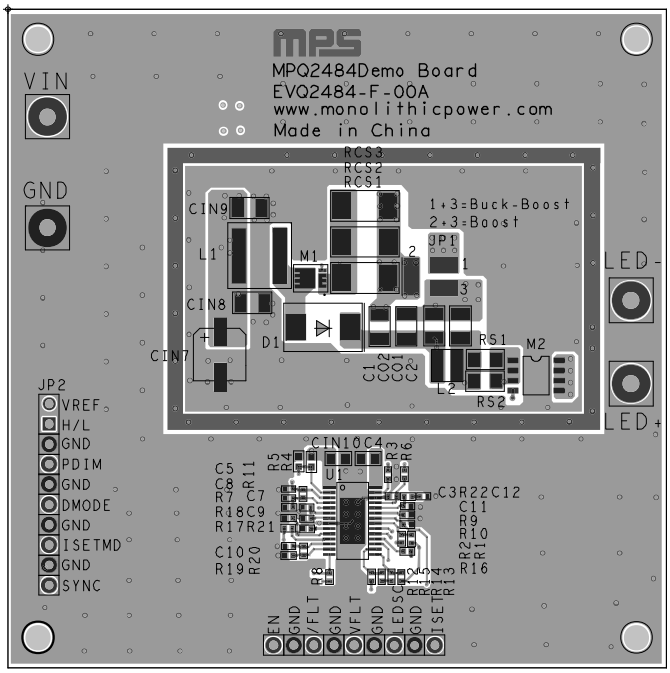


Figure 6: Top Silk and Top Layer

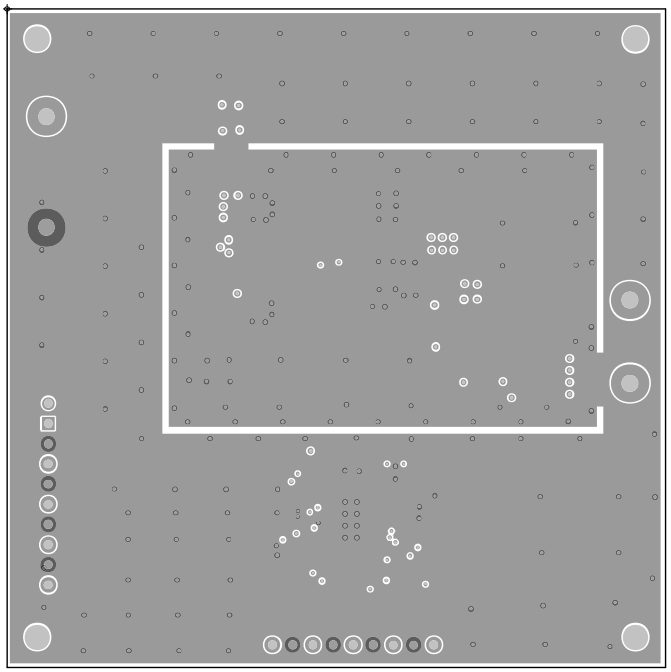


Figure 7: Mid-Layer 1

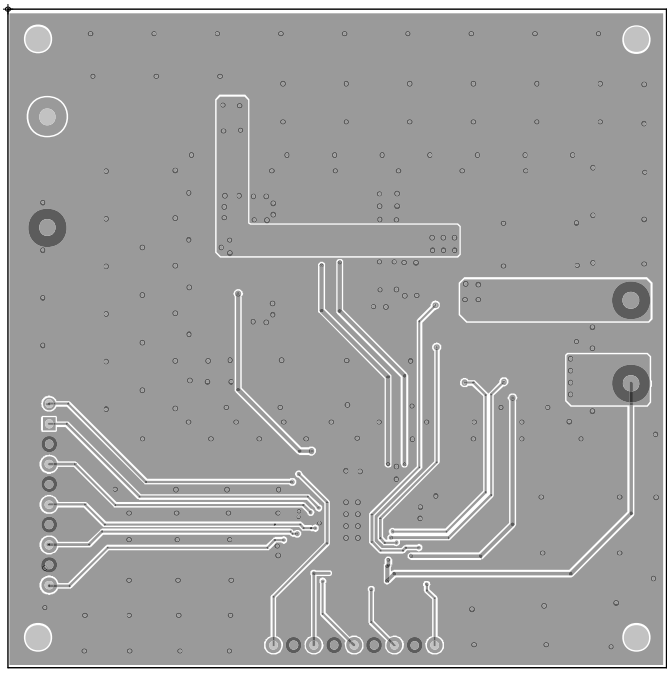


Figure 8: Mid-Layer 2

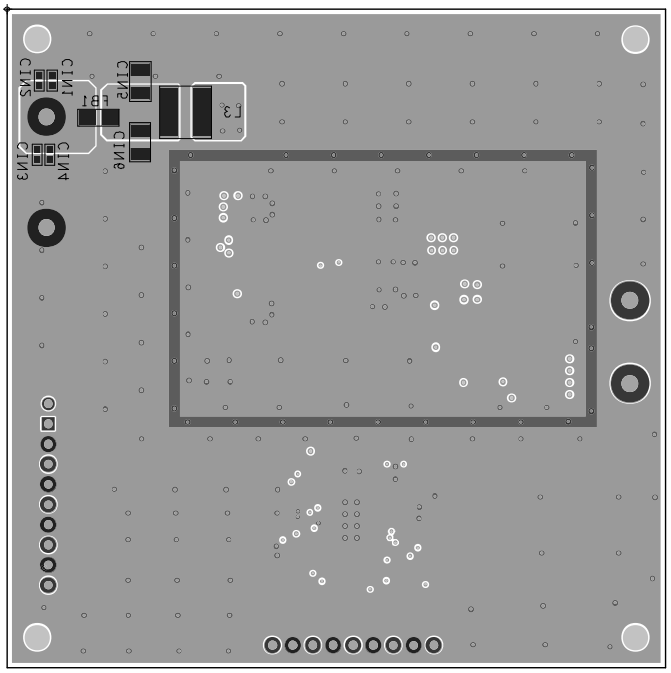


Figure 9: Bottom Layer and Bottom Silk

REVISION HISTORY

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