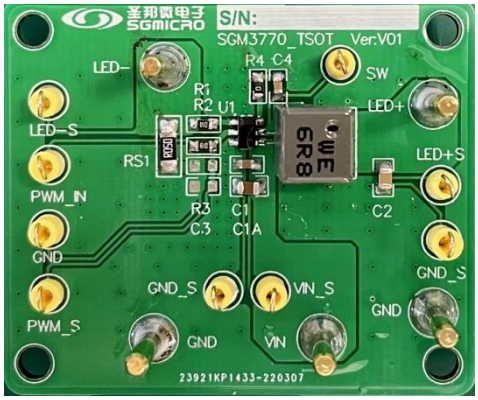
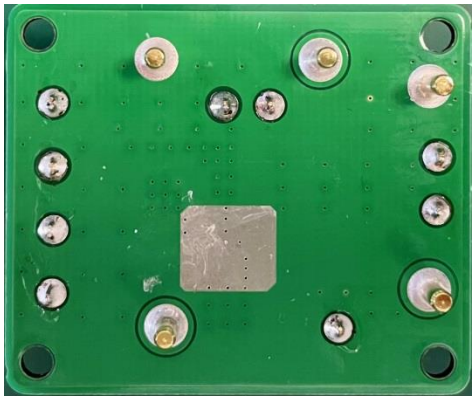
SGM3770 Demo Board Test Report

4.2V to 28V Input, Maximum 2A LED Current

Demo Board Picture:



Top Layer



Bottom Layer

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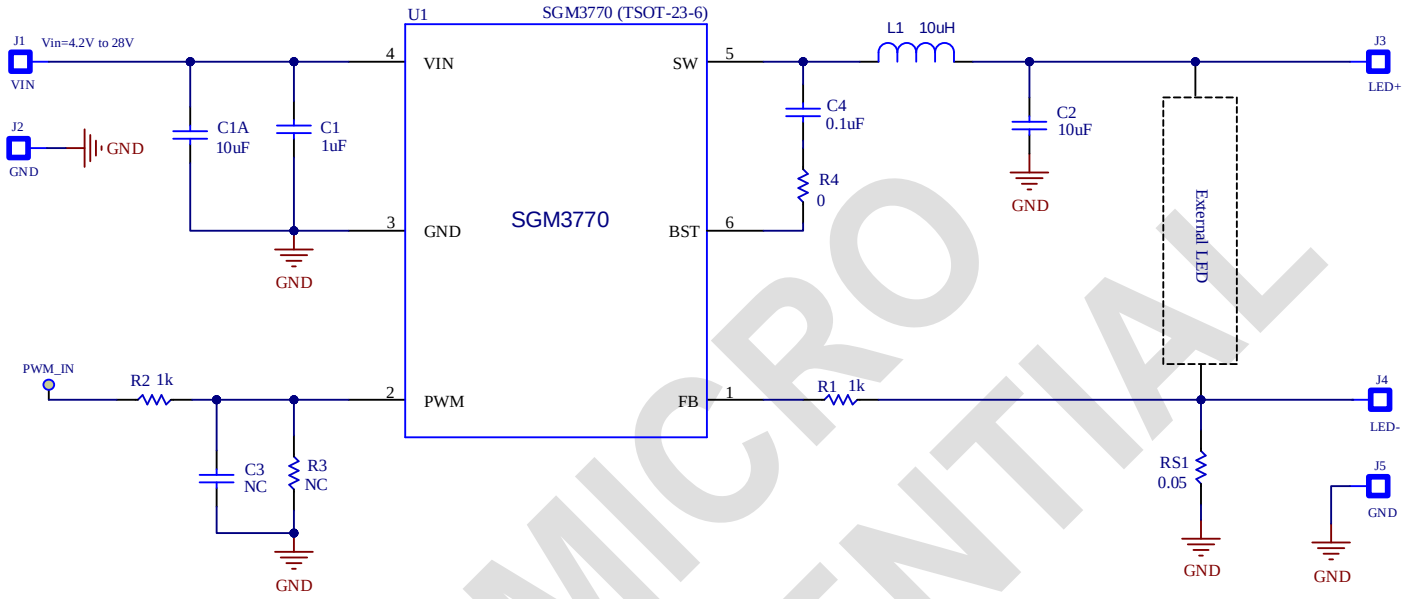
1. Schematic, BOM List and PCB Layout

1.1 Schematic



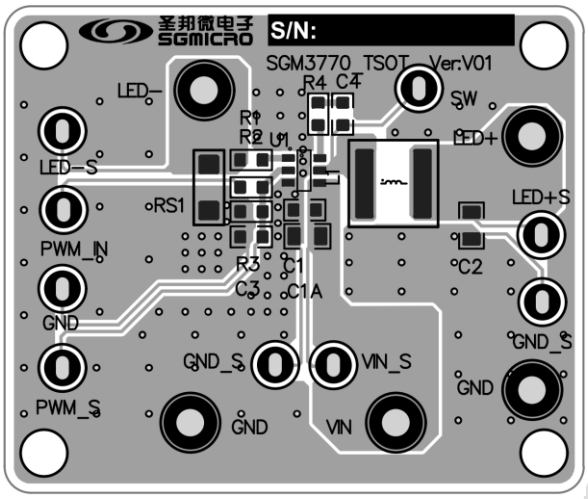
1.2 BOM List

Item	Quantity	Designator	Description	Manufactory
1	1	C1	Ceramic Capacitor, 1μF, 50V, ±10%, X5R, 0603	
2	2	C1A, C2	Ceramic Capacitor, 10μF, 35V, ±10%, X5R, 0805	
3	0	C3	NC	
4	1	C4	Ceramic Capacitor, 0.1μF, 16V, ±10%, X7R, 0603	
5	1	L1	Inductor, 10μH, I_S=7.6A, I_R=5A, DCR=26.5mΩ, 6060	Wurth: 74439346100
6	2	R1, R2	Film Resistor, 1kΩ, 0.1W, 1%, 0603	
7	0	R3	NC	
8	1	R4	Film Resistor, 0Ω, 0.1W, 1%, 0603	
9	1	RS1	Sense Resistor, 50mΩ, 0.5W, 1%, 1206	Wurth: 560050332001
10	1	U1	PWM Control Linear Dimming LED Driver, TSOT-23-6	SGMICRO: SGM3770XTN6G/TR
				Conclusion: Total 10 Components

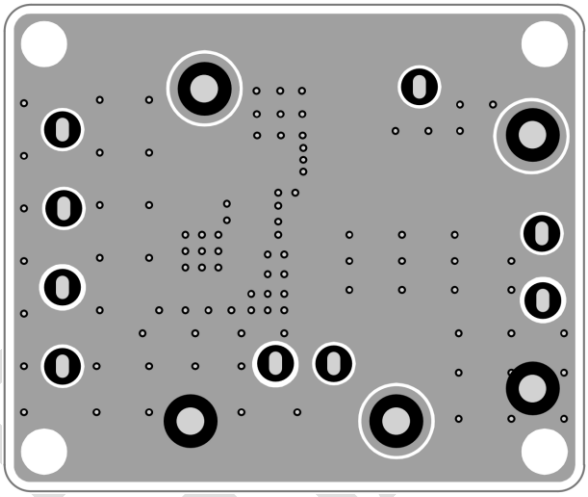
NOTE:

1. SGM3770XTN6G/TR (TSOT-23-6) is used as an example in this test report, unless otherwise noted.
2. For SGM3770XTGE6G/TR (TDFN-2×2-6EL) version, only the pins order is different, but the schematic and BOM list are the same as SGM3770XTN6G/TR (TSOT-23-6).

1.3 PCB Layout



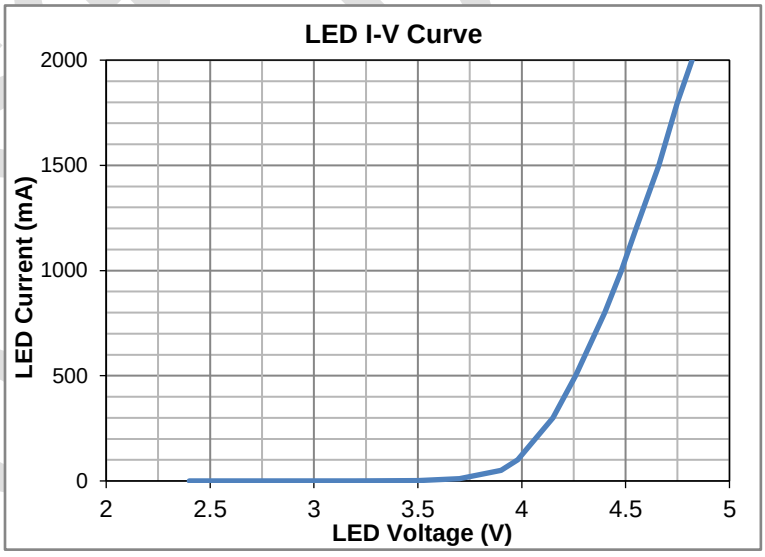
Top Layer



Bottom Layer

1.4 LED I-V Curve

The I-V curve for the LED string used in this test report is shown below:



2. Demo Board Test Setup

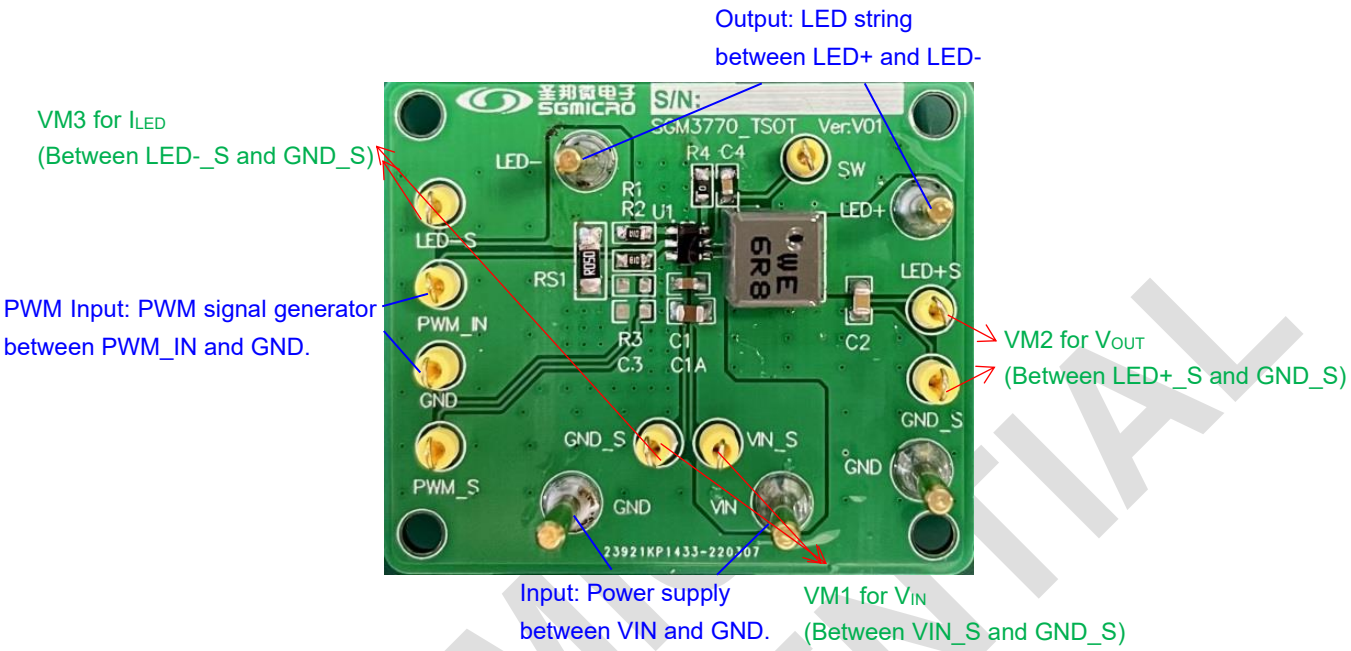


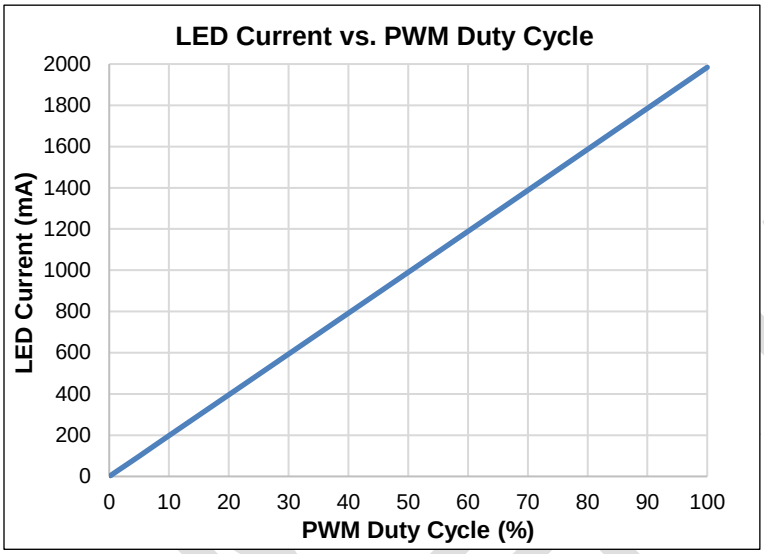
Fig-1: SGM3770 Demo Board Test Setup and Measurement

1. Turn off and connect an input power supply (12V typical) to the demo board according to Fig-1 setup.
2. Connect the LED string to the demo board according to Fig-1 setup.
3. Turn off and connect a PWM signal generator to the demo board according to Fig-1 setup, set the appropriate PWM signal amplitude, frequency and duty cycle.
4. Turn on the input power supply and PWM signal generator, SGM3770 enters normal operation.
5. The V_{IN}, V_{OUT}, I_{LED} can all be measured according to Fig-1. The current sense resistor RS1 between LED- and GND is used to set the LED current, and the I_{LED} can be measured by measuring the sense resistor voltage.

3. Test Item

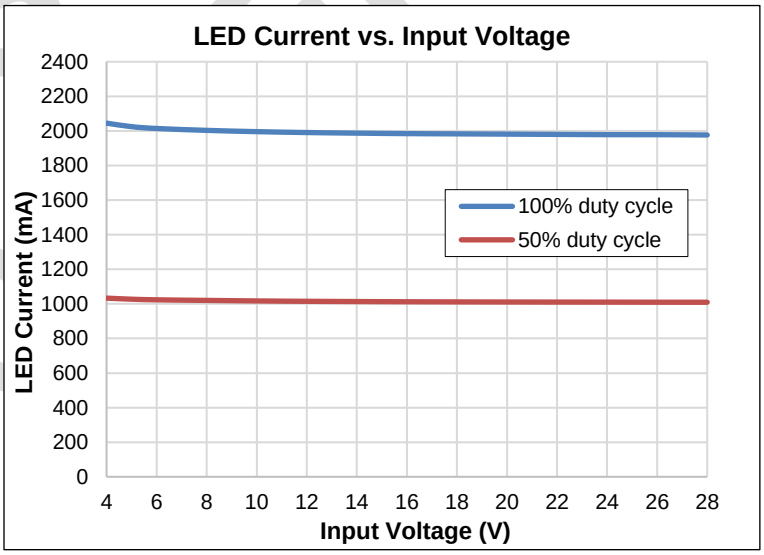
3.1 PWM Dimming Curve

Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, f_{PWM}=50kHz. Measure the LED current under different PWM duty cycle.



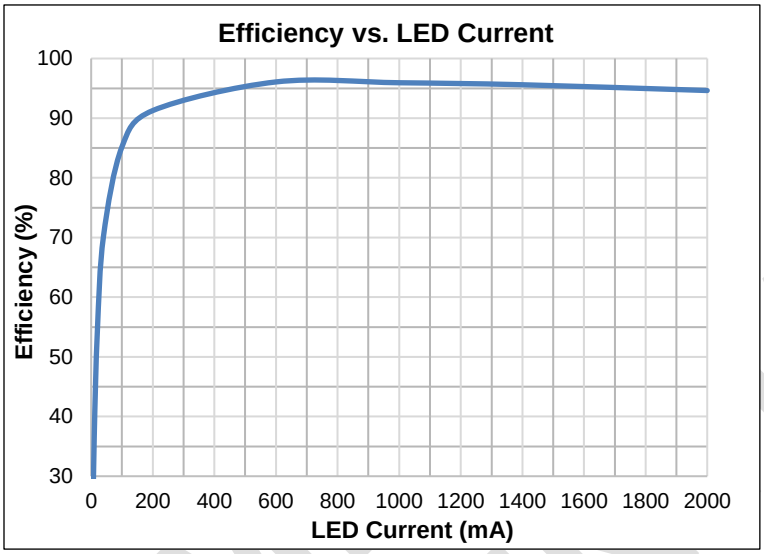
3.2 Line Regulation

Test conditions: R_{SENSE}=50mΩ, f_{PWM}=50kHz. Measure the LED current under different input voltage.



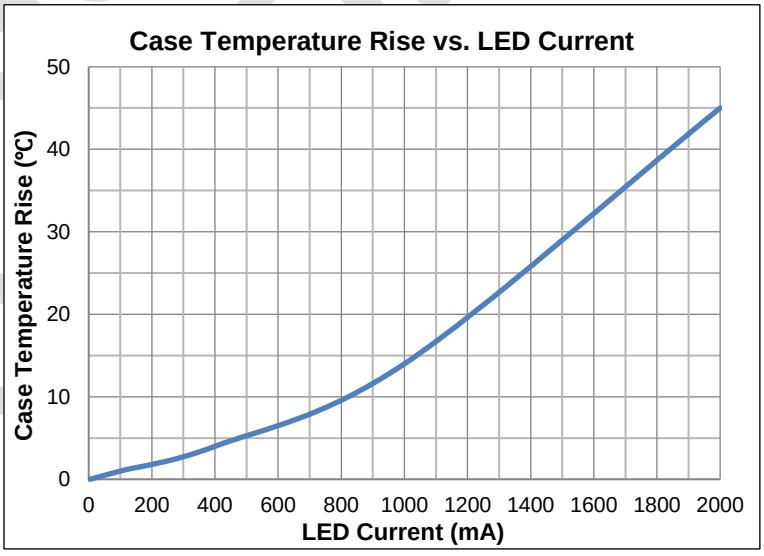
3.3 Efficiency

Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, f_{PWM}=50kHz. Measure the efficiency under different LED current.



3.4 Thermal Test

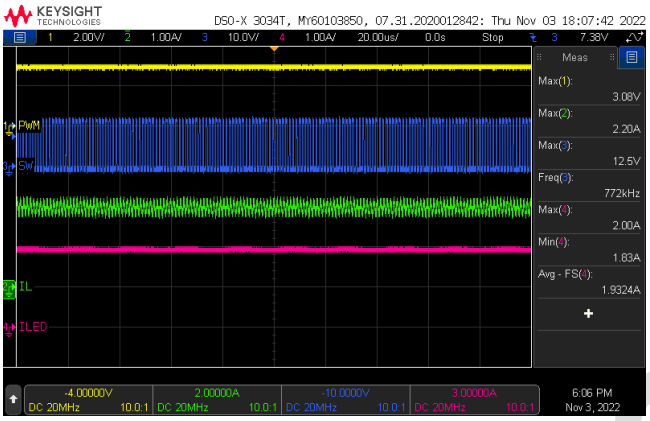
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, f_{PWM}=50kHz. Measure IC case temperature rise under different LED current.



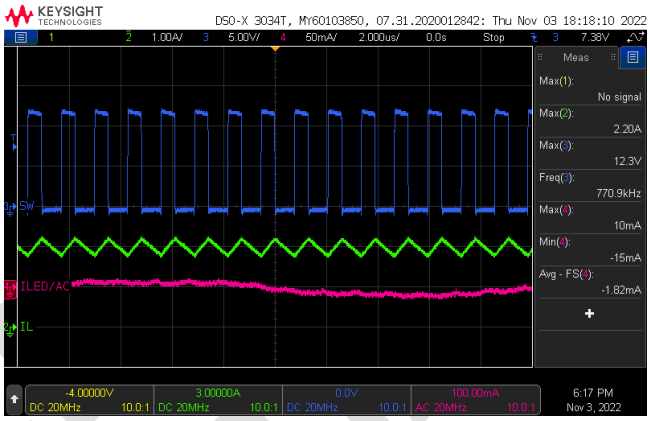
3.5 Steady State Test

Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, f_{PWM}=50kHz, set different PWM duty cycle.

PWM duty cycle=100%

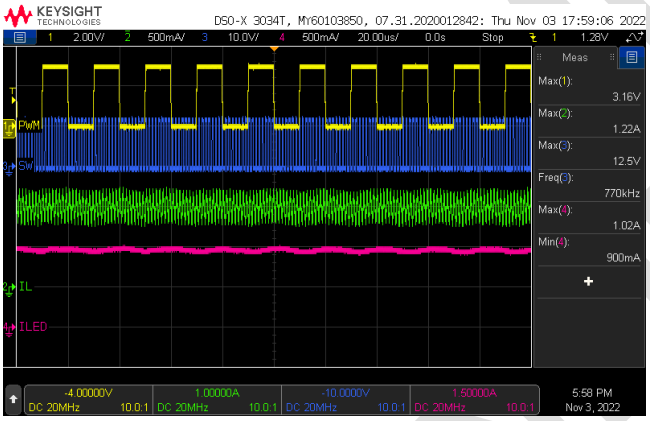


Ch1-V_{PWM}, Ch2-I_L, Ch3-V_{SW}, Ch4-I_{LED}

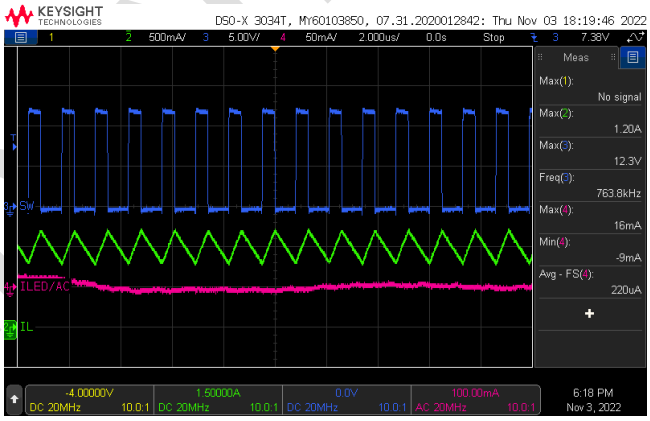


Ch2-I_L, Ch3-V_{SW}, Ch4-$I_{LED/AC}$

PWM duty cycle=50%

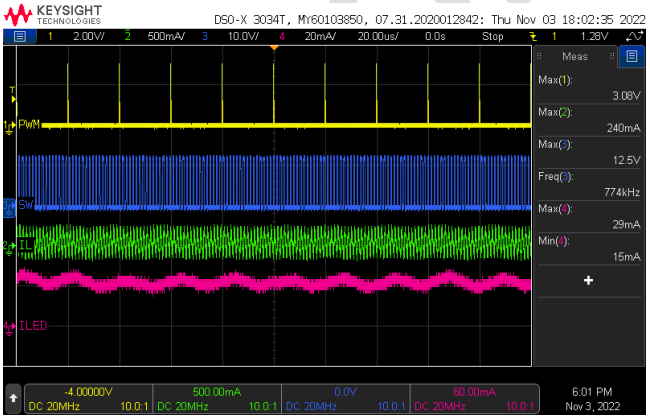


Ch1-V_{PWM}, Ch2-I_L, Ch3-V_{SW}, Ch4-I_{LED}

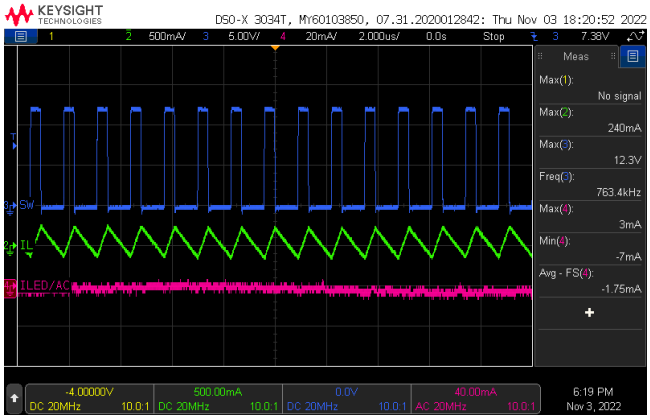


Ch2-I_L, Ch3-V_{SW}, Ch4-$I_{LED/AC}$

PWM duty cycle=1%



Ch1-V_{PWM}, Ch2-I_L, Ch3-V_{SW}, Ch4-I_{LED}

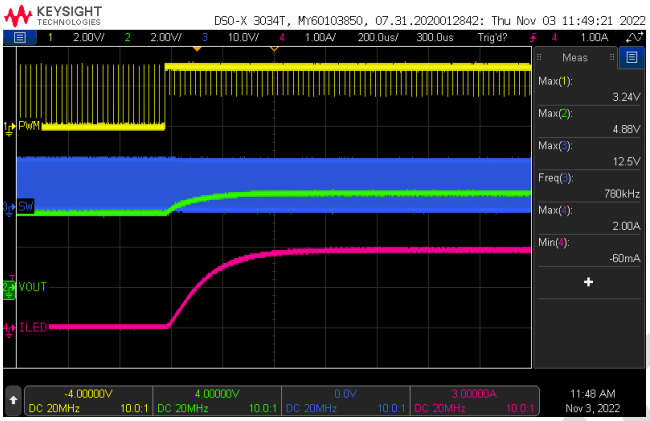


Ch2-I_L, Ch3-V_{SW}, Ch4-$I_{LED/AC}$

3.6 Dimming Transient Test

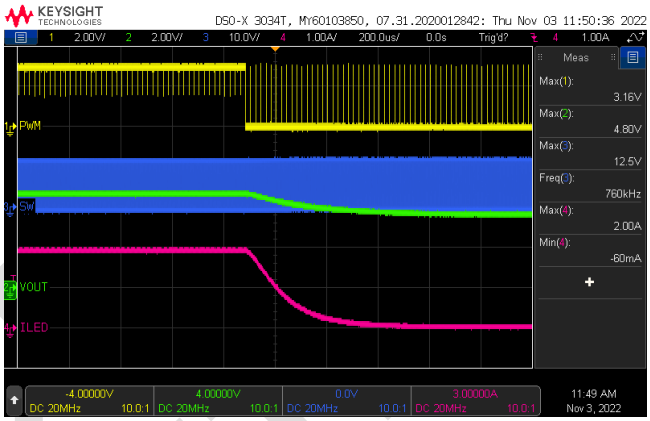
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, f_{PWM}=50kHz, change PWM duty cycle to dimming.

Change PWM duty cycle from 1% to 100%



Ch1-V_{PWM}, Ch2-V_{OUT}, Ch3-V_{SW}, Ch4-I_{LED}

Change PWM duty cycle from 100% to 1%

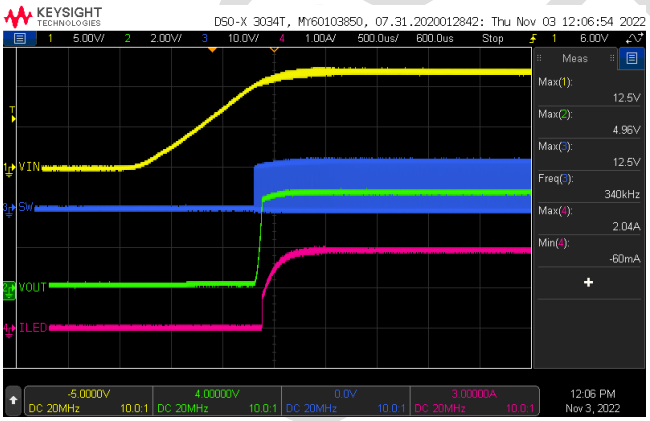


Ch1-V_{PWM}, Ch2-V_{OUT}, Ch3-V_{SW}, Ch4-I_{LED}

3.7 V_{IN} Startup and Shutdown

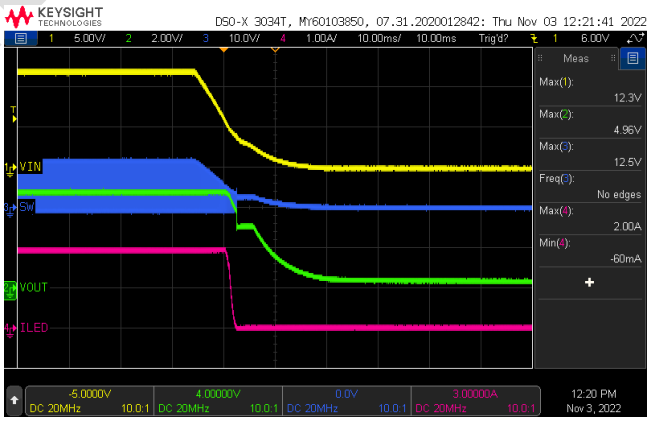
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, PWM duty cycle=100%.

V_{IN} startup



Ch1-V_{IN}, Ch2-V_{OUT}, Ch3-V_{SW}, Ch4-I_{LED}

V_{IN} shutdown

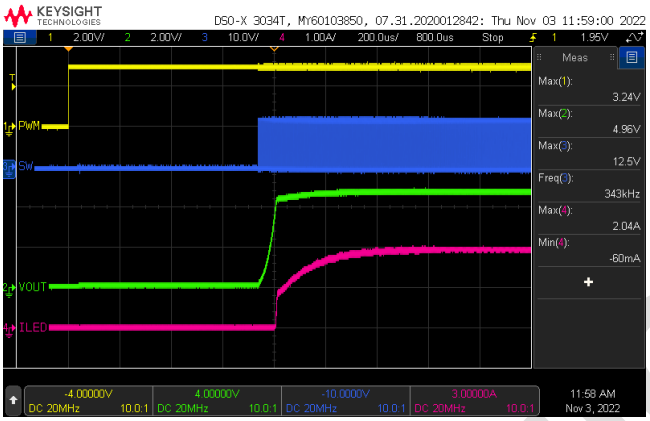


Ch1-V_{IN}, Ch2-V_{OUT}, Ch3-V_{SW}, Ch4-I_{LED}

3.8 PWM Startup and Shutdown

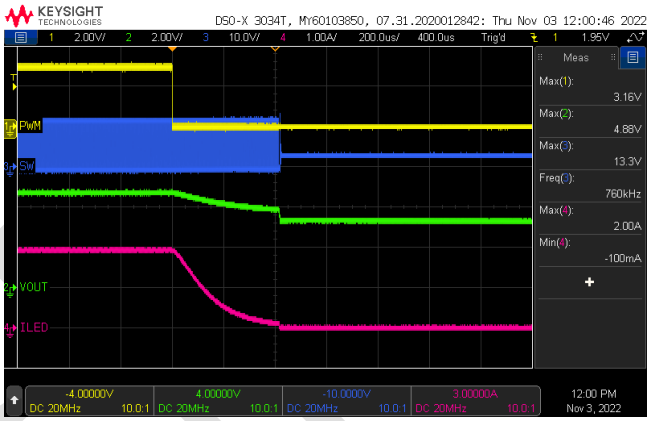
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, PWM duty cycle=100%. Turn on/off PWM signal to startup/shutdown the device.

PWM startup



Ch1-V_{PWM}, Ch2-V_{OUT}, Ch3-V_{SW}, Ch4-I_{LED}

PWM shutdown

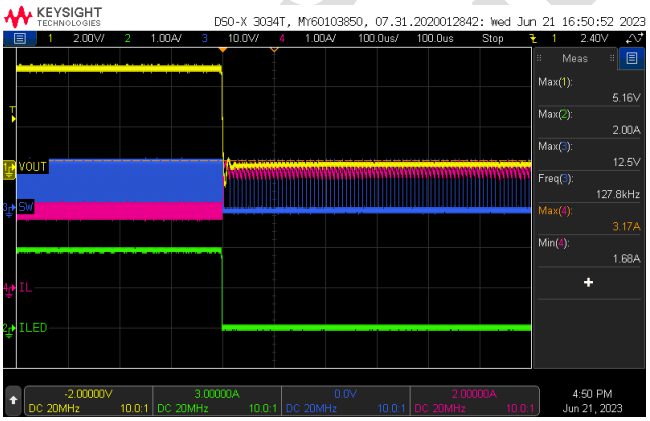


Ch1-V_{PWM}, Ch2-V_{OUT}, Ch3-V_{SW}, Ch4-I_{LED}

3.9 LED+ and GND Short Protection

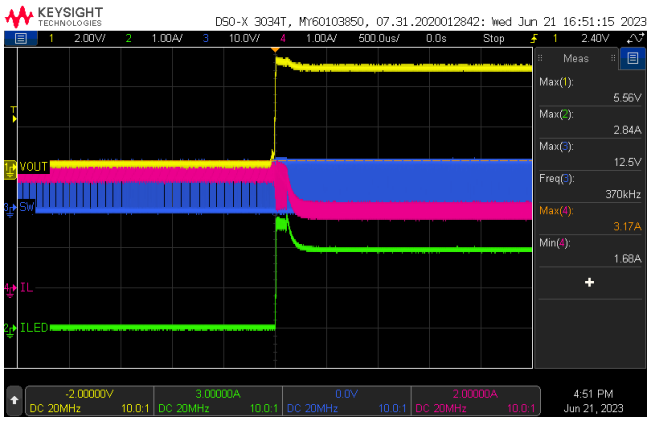
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, PWM duty cycle=100%. Short LED+ (V_{OUT}) to GND and then release short.

Short LED+ to GND



Ch1-V_{OUT}, Ch2-I_{LED}, Ch3-V_{SW}, Ch4-I_L

Release LED+ short

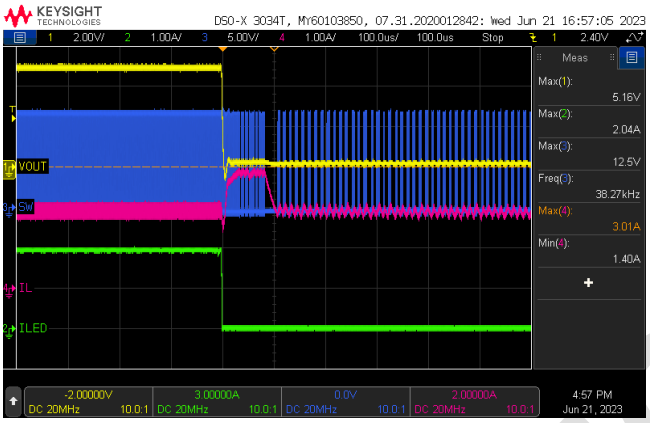


Ch1-V_{OUT}, Ch2-I_{LED}, Ch3-V_{SW}, Ch4-I_L

3.10 LED+ and LED- Short Protection

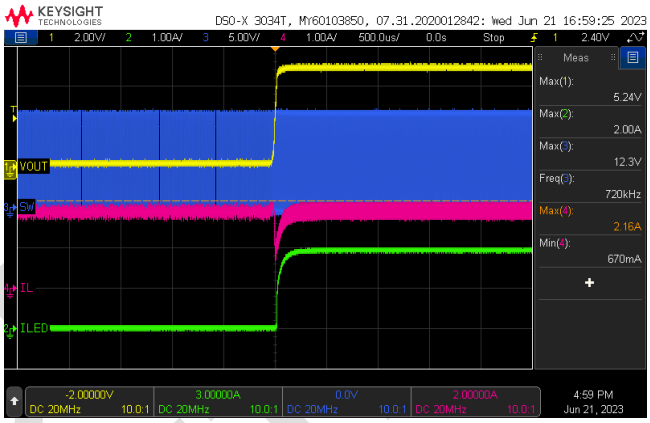
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, PWM duty cycle=100%. Short LED+ to LED- and then release short.

Short LED+ to LED-



Ch1-V_{OUT}, Ch2-I_{LED}, Ch3-V_{SW}, Ch4-I_L

Release LED short

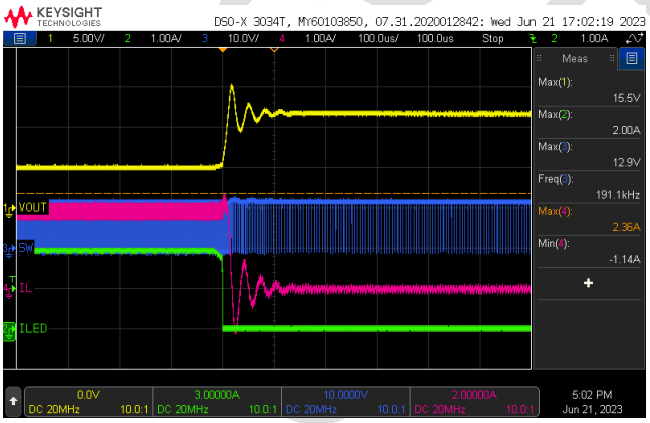


Ch1-V_{OUT}, Ch2-I_{LED}, Ch3-V_{SW}, Ch4-I_L

3.11 LED Open Load Protection

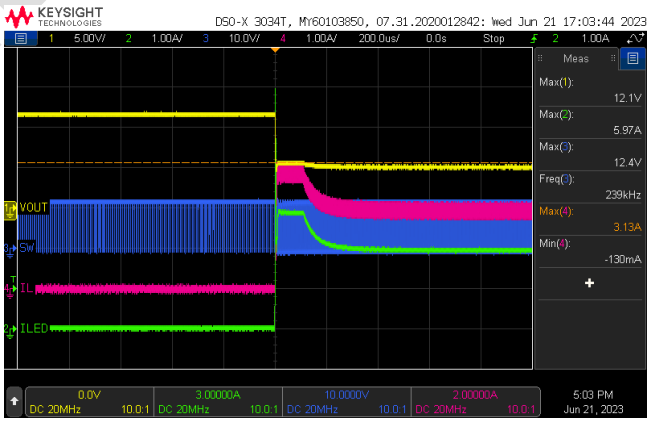
Test conditions: V_{IN}=12V, R_{SENSE}=50mΩ, PWM duty cycle=100%. LED open load and then recovery.

Open LED during normal operation



Ch1-V_{OUT}, Ch2-I_{LED}, Ch3-V_{SW}, Ch4-I_L

LED open recovery



Ch1-V_{OUT}, Ch2-I_{LED}, Ch3-V_{SW}, Ch4-I_L