FAQ of LP8556

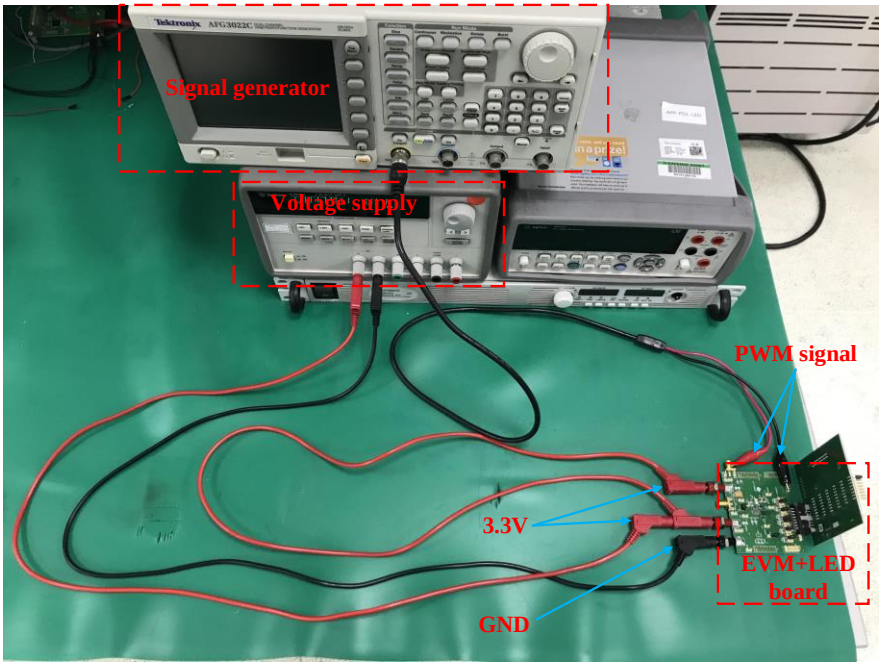
Contents

Q1: EVM hardware connection.

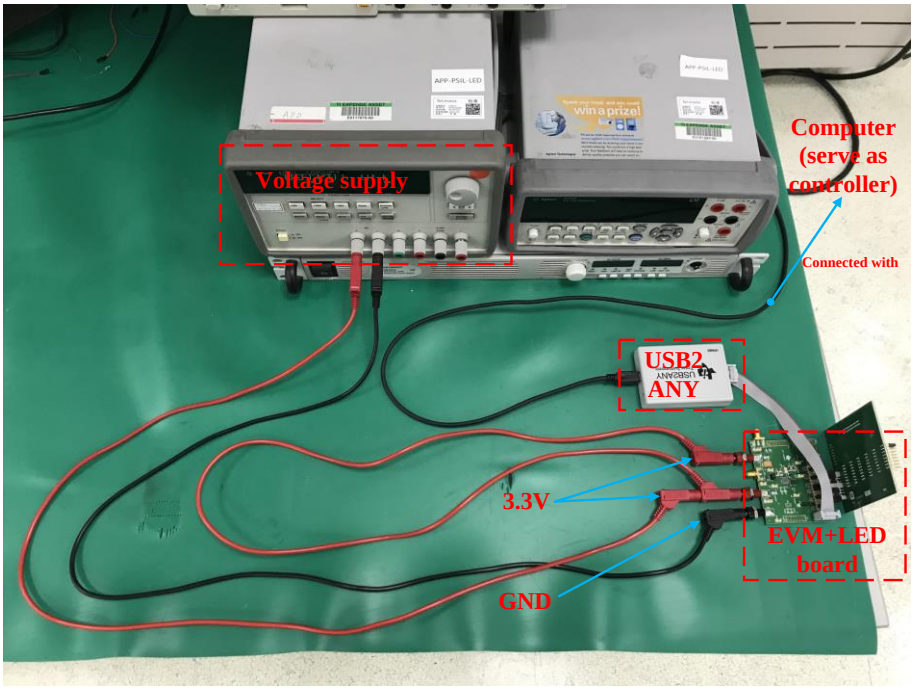
A1: The LP8556SQ evaluation module (EVM) can be configured to work in two modes: **standalone mode** and **controlled mode**. The biggest difference between these two modes is that: standalone mode can work according to the pre-configured registers and external input PWM signal instead of external controller. However, controlled mode means the LP8556 EVM must be configured by external controller in real time and external input PWM signal is not necessary. The external controller may be computer, MCU, DSP and so on.

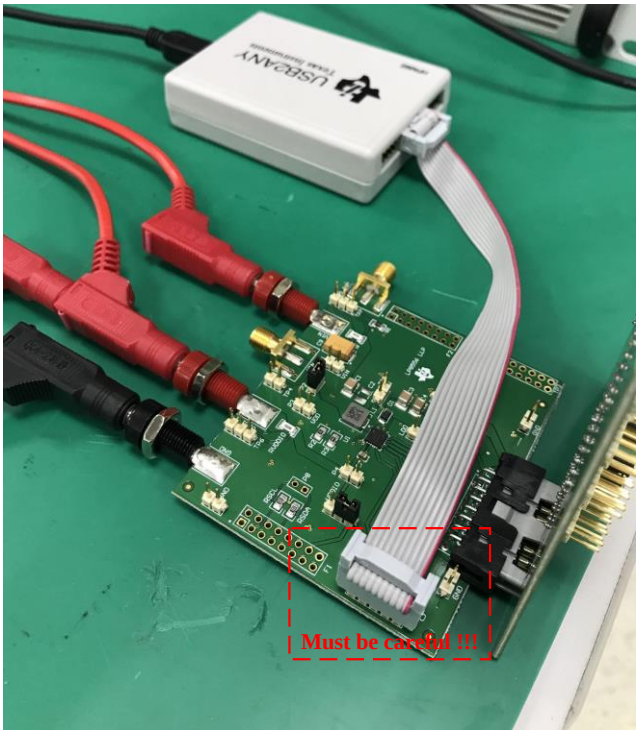
LP8556SQ EVM:

- Standalone mode connection is shown as following picture.



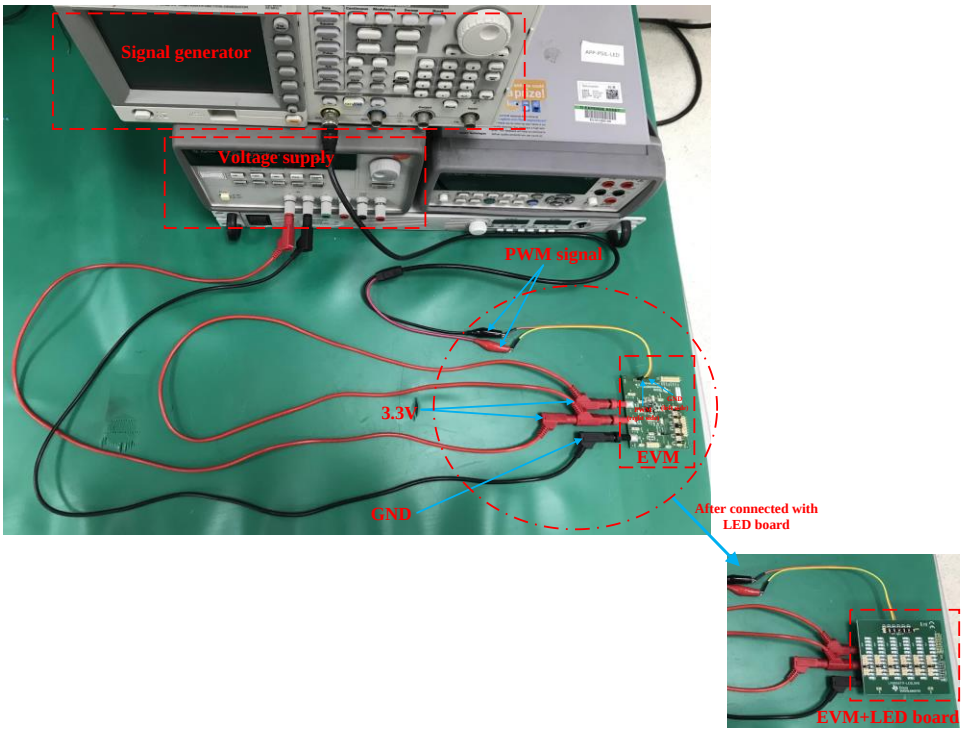
- Controlled mode connection is shown as following picture.



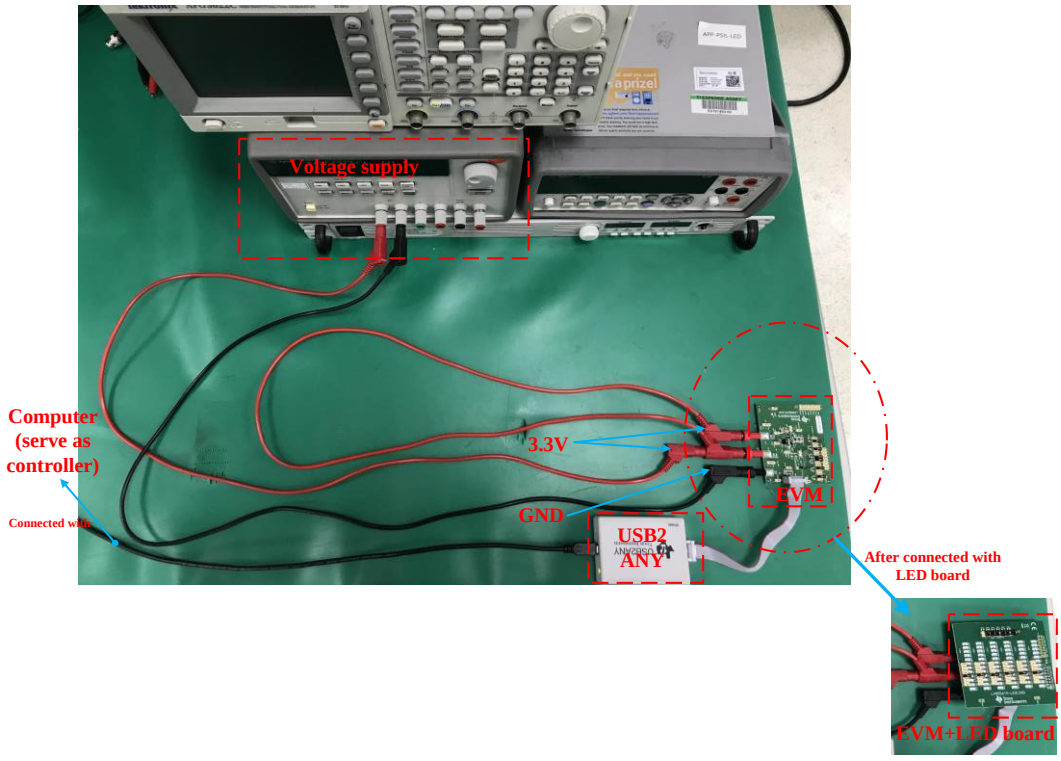


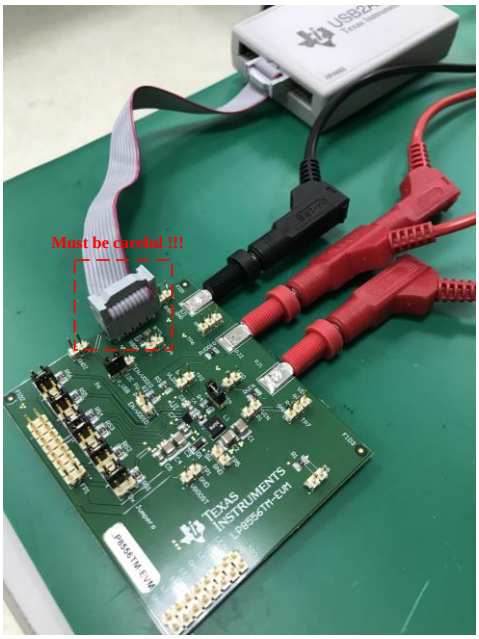
LP8556TM EVM:

- Standalone mode connection is shown as following picture.



- Controlled mode connection is shown as following picture.





Q2: Simple configuration to light on the LEDs.

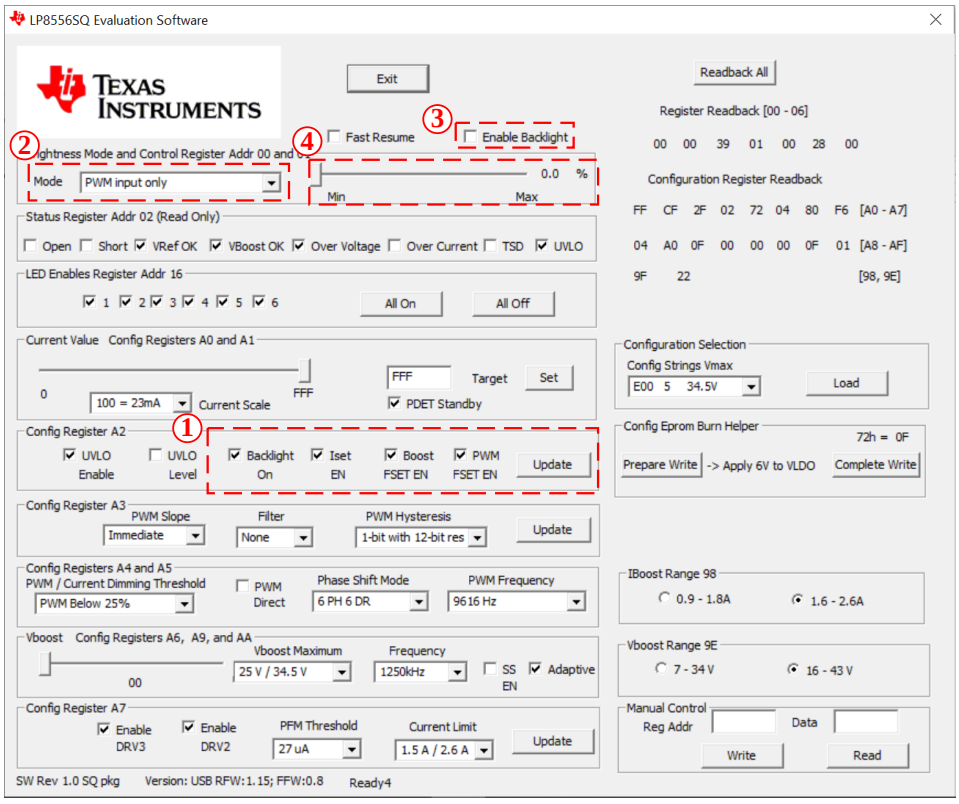
A2: For convenience and quick start, TI recommends you to control the EVM with LP8556 evaluation software (LP8556SQ.exe) named GUI. You can follow up below steps to light on the LEDs quickly.

Step 1: download the GUI (non-installation)

Visit https://www.ti.com/tool/LP8556SQ-EVM, and you will find a documentation named "LP8556SQ-EVM Software (including Schematic, Quick Start, and Documents)" in software development column. Then click it and start your download, after a few minutes, you will get a file named "snvc059.zip" in corresponding folder, don't hesitate and unzip it. There are five files including LP8556SQ.exe (GUI), and make sure that LP8556SQ.exe (GUI) and USB2ANY.dll in the same directory.

Step 2: connect EVM with computer and open the GUI

(1) Finish the controller mode connection just as the descripion above.
(2) Turn on the external voltage supplies. VIN jack can be connected to any valid **2.7V to 20V**. VDDIO1 jack can be connected to any valid **1.62V to 3.6V**. GND jack should be connected to ground of voltage supply. For test convenience, you can simply connect VIN jack and VDDIO1 jack together with **3.3V** voltage supply like above controller mode connection.
(3) Plug the USB2ANY into the computer's USB port.
(4) Double-click to run LP8556SQ.exe (GUI) and you will see the default interface shown as the figure below.



Step 3: configure the GUI and light on the LEDs

(1) Make sure these boxes are in uncheck state: Backligh ON, Iset EN, Boost FSET EN and PWM FSET EN.
If there is any box is in check state, please uncheck it and click update on the right hand. In addition, above boxes are located at “Config Register A2” column.

(2) Change the brightness mode from “PWM input only” (default mode) to “Brightness reg only”. You can achieve this change in the dropdown box of “Mode” located at “Brightness Mode and Control Register Addr 00and 01” column.

(3) Check the “Enable Backlight” box located at the top of GUI interface.

(4) Move the slider located at “Brightness Mode and Control Register Addr 00and 01” column. The brightness of LEDs is varied along with movement from “Min” to “Max”.

Q3: Set LED current in 12-bit fine steps.

A3: The 8-bit register (Current LSB) defined in “CFG0” along with the 4-bit register (Current MSB) defined in “CFG1” allows LED current to be set in 12-bit fine steps. **What you should be careful about is that you need to write “Current LSB” firstly and then write “Current MSB”.**

In addition, setting LED current in 12-bit doesn’t mean the output current’s resolution is 12-bit. It also depends on the dimming mode. The detailed description is summarized as below.

	PWM dimming	Pure current dimming	Adaptive dimming	
			PWM dimming part	Current dimming part
Current resolution	Set by EPROM memory: 8bit to 11bit	12 bit	Set by EPROM memory: 8bit to 11bit	12bit
	Set by external resistor: 9bit to 12bit		Set by external resistor: 9bit to 12bit	

Q4: Key features' clarification.

A4: The "DEVICE OPTION" column, fifth chapter of LP8556 datasheet, means the default configuration of the registers instead of fixed configuration. As long as there is I2C interface in the system, these configurations can be modified after power on.

Default but can be configured

ORDERABLE DEVICE[1]	PACKAGE TYPE	DEVICE OPTION	LED CHANNEL COUNT	MAXIMUM LED CURRENT	BOOST OUTPUT VOLTAGE RANGE
LP8556SQ-E00/NOPB LP8556SQE-E00/NOPB LP8556SQX-E00/NOPB	WQFN	"PWM Only" – Recommended for systems without an I²C master.	5	23 mA	16 V to 34.5 V
LP8556SQ-E08/NOPB LP8556SQE-E08/NOPB LP8556SQX-E08/NOPB			4		
LP8556SQ-E09/NOPB LP8556SQE-E09/NOPB LP8556SQX-E09/NOPB			6		
LP8556TME-E02/NOPB LP8556TMX-E02/NOPB	DSBGA	"PWM and I²C" - Recommended for systems with an I²C master.	6	25 mA	16 V to 30 V
LP8556TME-E03/NOPB LP8556TMX-E03/NOPB		"PWM Only" – Recommended for systems without an I²C master.	5	20 mA	16 V to 34.5 V
LP8556TME-E04/NOPB LP8556TMX-E04/NOPB			6	20 mA	16 V to 25 V
LP8556TME-E05/NOPB LP8556TMX-E05/NOPB		"Non-programmed" – This option is for evaluation purposes only.	Can be programmed to any available.	25 mA	Can be programmed to any available.
LP8556TME-E06/NOPB LP8556TMX-E06/NOPB		"PWM Only" – Recommended for systems without an I²C master.	5	25 mA	16 V to 39 V
LP8556TME-E07/NOPB LP8556TMX-E07/NOPB			4	20 mA	12.88 V to 30 V
LP8556TME-E09/NOPB LP8556TMX-E09/NOPB			6	23 mA	16 V to 34.5 V
LP8556TME-E11/NOPB LP8556TMX-E11/NOPB		"PWM and I²C" - Recommended for systems with an I²C master.	3	23 mA	7 V to 21 V

In fact, all LP8556 versions' maximum current per channel is up to 50mA. As for boost output voltage, each orderable device is 7V-43V. I2C control and configurable channel count (1-6) are common features for every version of LP8556.

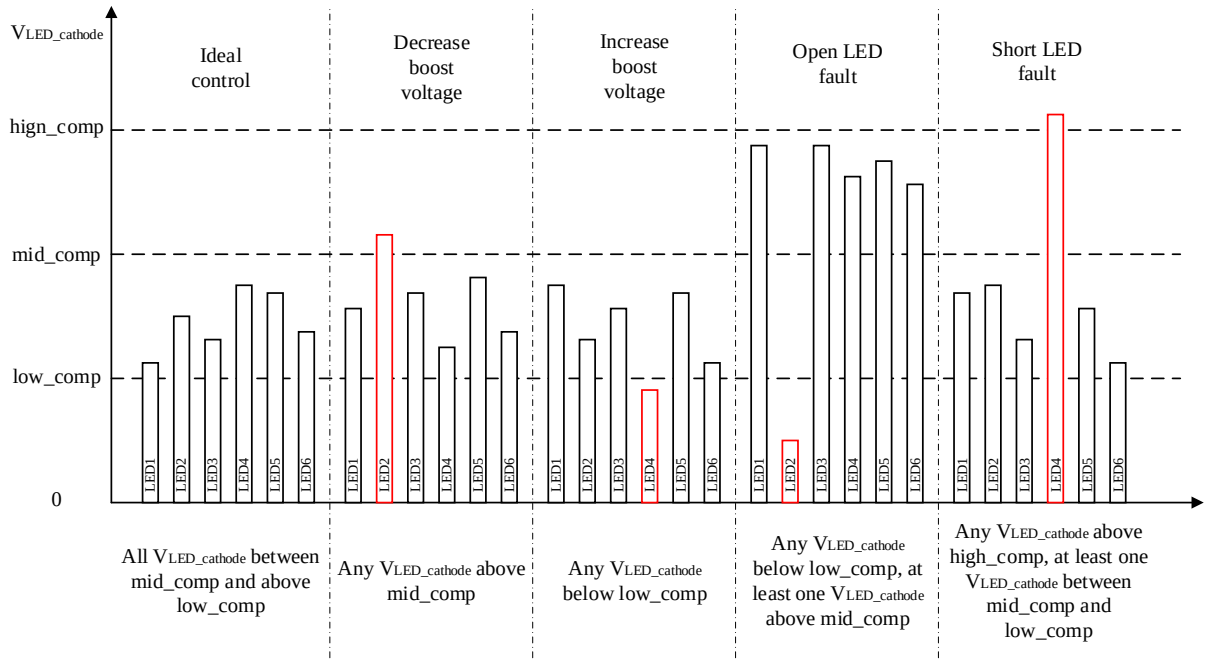
Q5: Direct dimming mode setup.

A5: There are two ways to achieve direct dimming mode for LP8556:

- The first one is configuring register, which can be obtained by setting "PWM-DIRECT" bit to 1 (CFG5[7]=1).
- The second one is shorting FSET pin to GND.

Q6: Adaptive boost output voltage working mechanism.

A6: The purpose of the adaptive boost is to make the output voltage stay at proper value. Each channel of LP8556 has three comparators including high_comp, mid_comp and low_comp. All LED pins' voltage $V_{LED\_cathode}$ will be maintained above low_comp but below mid_comp, which can reduce current sink power consumption as much as possible. The detailed mechanism can be shown as following figure.



Q7: Difference between DSBGA package and WQFN package.

A7: Two main differences between these two packages are summarized as below table.

			DSBGA	WQFN
SW current limit (A)	IBOOST_LIM_2X=0 (CFG98[7]=0)	IBOOST_LIM=00 (CFG7[1]=0 & CFG7[0]=0)	0.9	0.9
		IBOOST_LIM=01 (CFG7[1]=0 & CFG7[0]=1)	1.2	1.2
		IBOOST_LIM=10 (CFG7[1]=1 & CFG7[0]=0)	1.5	1.5
		IBOOST_LIM=11 (CFG7[1]=1 & CFG7[0]=1)	1.8 (Maximum)	1.8
	IBOOST_LIM_2X=1 (CFG98[7]=1)	IBOOST_LIM=00 (CFG7[1]=0 & CFG7[0]=0)	Not permitted	1.6
		IBOOST_LIM=01 (CFG7[1]=0 & CFG7[0]=1)	Not permitted	2.1
		IBOOST_LIM=10 (CFG7[1]=1 & CFG7[0]=0)	Not permitted	2.6 (Maximum)
		IBOOST_LIM=11 (CFG7[1]=1 & CFG7[0]=1)	Not permitted	Not permitted
Thermal resistance (°C/W)	$R_{\theta JA}$ (Junction to ambient)		66.2	35.0
	$R_{\theta JC\ (top)}$ (Junction to top case)		0.5	32.2
	$R_{\theta JB}$ (Junction to board)		15.1	13.7
	Ψ_{JT} (Junction to top characterization parameter)		1.9	0.3
	Ψ_{JB} (Junction to board characterization parameter)		15.0	13.8
	$R_{\theta JC\ (bot)}$ (Junction to bottom case)		n/a	3.3