AN-1321 LM2796 Evaluation Board

1 Board Operation

1.1 Basic Connections

To operate the LM2796 evaluation board, connect a supply voltage (2.7V-5.5V) between board connectors VIN and GND.

Default Jumper Connections:

- EN: Connects the "+" post to the middle post of the EN header strip. This connects VIN to the EN pin of the LM2796, enabling the part.
- ENA: Connects the "+" post to the middle post of the ENA header strip. This connects VIN to the ENA pin of the LM2796, enabling D1A-D4A outputs
- ENB: Connects the "+" post to the middle post of the ENB header strip. This connects VIN to the ENB pin of the LM2796, enabling D1B-D3B outputs.
- LEDS_ON: Jumper connects the two posts of the LEDS_ON header strip. This connects the cathodes of all 7 LEDs to GND, establishing the LED current path.

When these connections are all made correctly, all LEDs will be ON.

1.2 R_{SET}: Setting LED Currents

The resistance of the R_{SET} resistor sets the DC output currents of the LM2796 according to equation:

$$I_{Dxx} = 100 \text{ X } (1.25V / Rset) \quad (1)$$

The default R_{SET} on the evaluation board is 8.3kΩ and gives a DC output current of 15mA (typ.).

Component Rset' is an optional leaded resistor replacement for the surface mount Rset, provided for ease of use.

1.3 EN, ENA, and ENB Headers: LED Activation and PWM Brightness Control

The header strips EN, ENA, and ENB can be used to enable/disable the LM2796 and/or the LED (output) currents. The connections to the ENx pins provided by these posts can also be used to connect pulse-width modulated (PWM) signals to the LM2796 in order to adjust the average brightness of the LEDs.

On each of these header strips, the post labeled "+" is connected to VIN. The post labeled "-" is connected to GND. The middle post connects to EN, ENA, and ENB, respectively.

Jumpers can be used to connect each ENx pin to either VIN or GND. Connecting EN to VIN enables the charge pump and other internal circuitry of the LM2796. Connecting EN to GND places the part in Shutdown mode.

When the part in enabled (EN = VIN), connecting ENA to VIN enables the D1A-D4A LEDs. Connecting ENA to GND disables these LEDs. Similarly, connecting ENB to VIN enables the D1B-D3B LEDs, and connecting ENB to GND disables them.

A pulse signal (PWM) can be connected to the ENA and/or ENB pins to adjust the brightness of the respective LED banks. The duty cycle of the pulse signal determines the net brightness, as perceived by the human eye. For example, with a duty cycle of 50%, the LEDs will only be ON for 50% of the time, and the perceived brightness will be approximately half of what the brightness is when the output current flows continuously through the LEDs. Recommended frequency range for PWM signals: 100Hz to 1kHz.

It is recommended that ENA and ENB pins be used for PWM brightness adjustment (dimming). Toggling the voltage on these pins turns the internal LM2796 current sources on and off, and the charge pump stays ON continuously. Placing a PWM signal on the EN pin repeatedly turns the internal charge pump ON and OFF. Each time the charge pump is activated, significant inrush current can be expected as the large external capacitors are quickly recharged. This could inject noise on the input line.

1.4 Using the LEDS on Headers to Measure Output Currents or to Drive Different LEDS

By removing the LEDS_ON jumper, LM2796 output currents can easily be measured. Removing the jumper disconnects the cathodes of all LEDs from GND, breaking the LED current paths. By placing a current meter between the two header pins, as shown on the following page in Figure 1, the sum total of all LED currents can be measured.

With the LEDS_ON jumper removed, the current of an individual output can be measured by placing a current meter between a Dxx header and GND, as shown in Figure 2.

With such a connection, the voltage on pin Dxx will be almost 0V because the series resistance of the current meter is likely to be quite small. Since the regulated output currents of the LM2796 are almost completely independent of Dxx pin voltage (provided V_{Dxx} is not too high to inhibit regulation), this measurement will still be quite accurate.

With the LEDS_ON jumper removed, the LM2796 can drive external LEDs simply by connecting each LED between a Dxx output and GND. The LEDs on the evaluation board need not be removed for this type of test/evaluation.

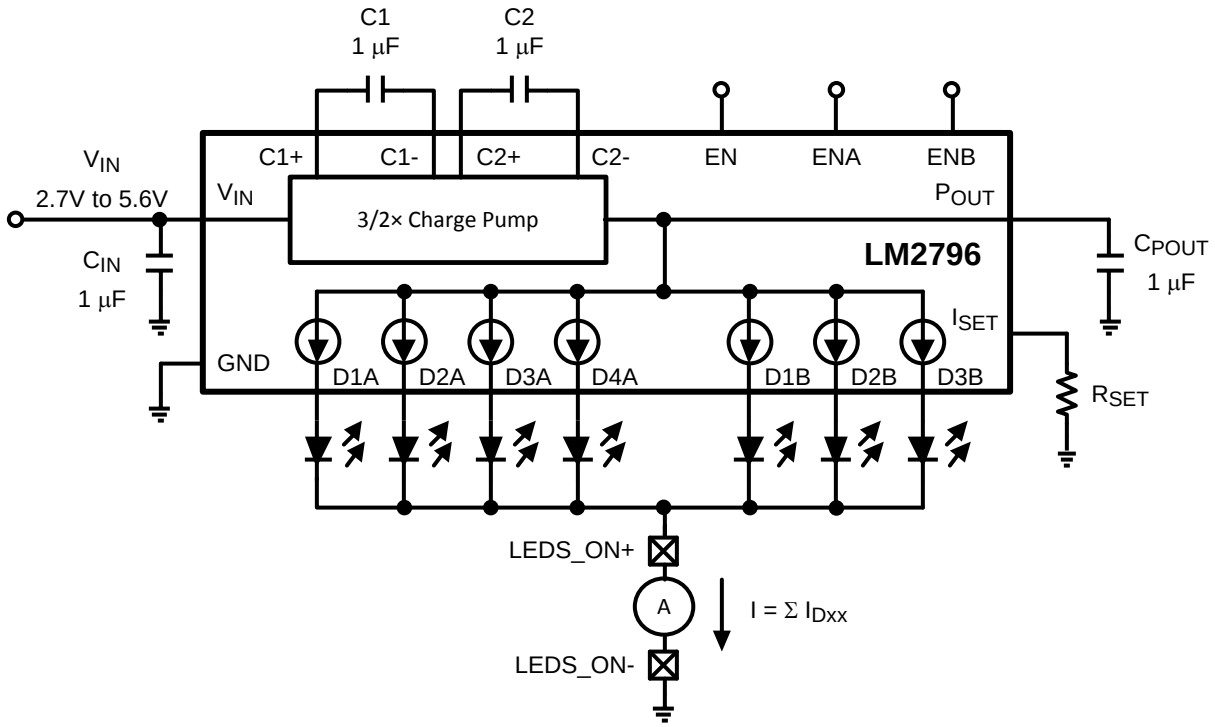


Figure 1. Measuring Current of all LEDs by Removing LEDs_ON Jumper and Placing a Current Meter Between the Two LEDS_ON Header Posts

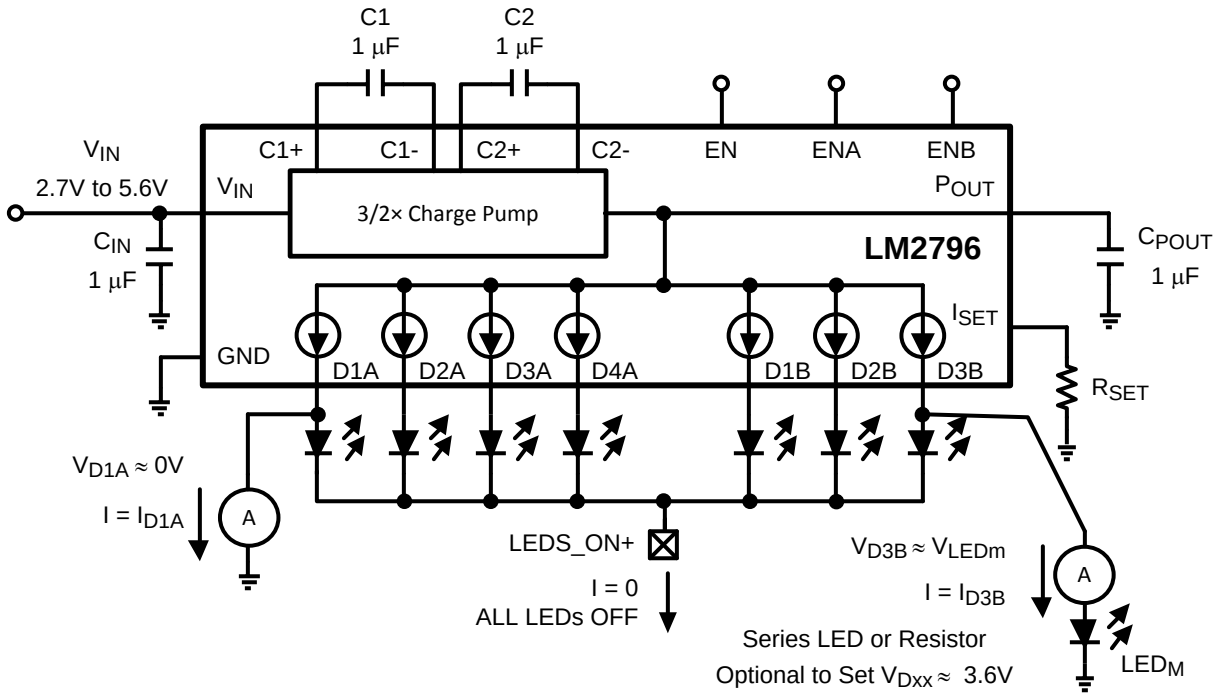
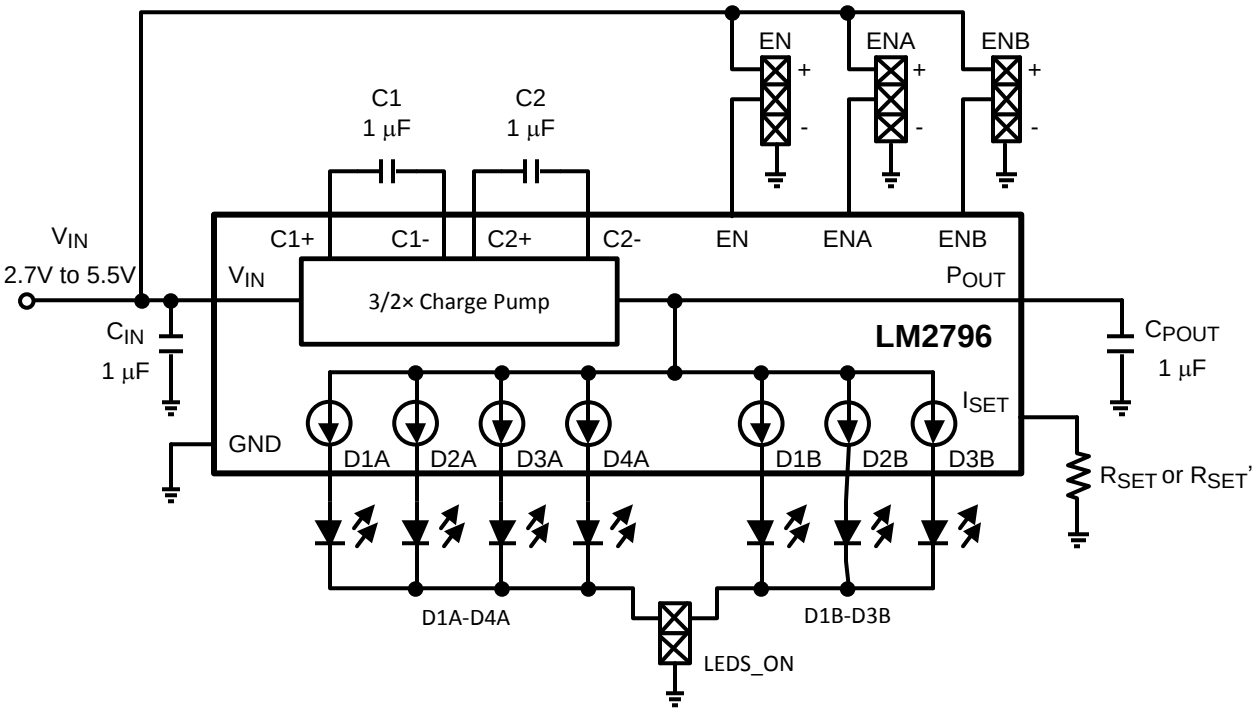


Figure 2. Measuring Current of All Individual D_{xx} Outputs by Removing the LEDS_ON Jumper and Placing Current Meters Between the D_{xx} Pins and GND

2 Schematic



3 Bill of Materials

Component Symbol	Value	Package [U.S. (Metric)]	Dimensions (mm)	Temperature Characteristic	Manufacturer	Part #
LM2796	--	YZR0018 DSBGA	2.1 x 2.4 x 0.6	--	Texas Instruments	LM2796
Cin, Cout	2.2µF, 6.3V	0603 (1608)	1.6 x 0.8 x 0.8	X5R	TDK	C1608X5R0J225K
C1, C2	1µF, 10V	0603 (1608)	1.6 x 0.8 x 0.8	X5R	TDK	C1608X5R1A105K
Dxx	White LEDs	--	1.5 x 2.3 x 1.4	--	OSRAM	LWM67C-T1U1-3C5D
Rset	8.3kΩ	0603 (1608)	1.6 x 0.8 x 0.8	--	Vishay-Dale	CRCW06048251F
Rset'	(optional)	--	--	--	--	--

4 LM2796 Evaluation Board Layout

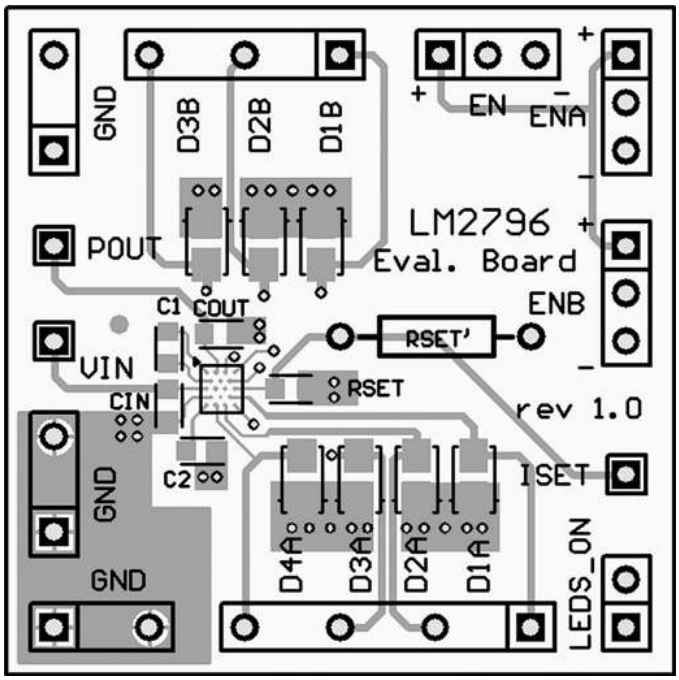


Figure 3. Top Layer

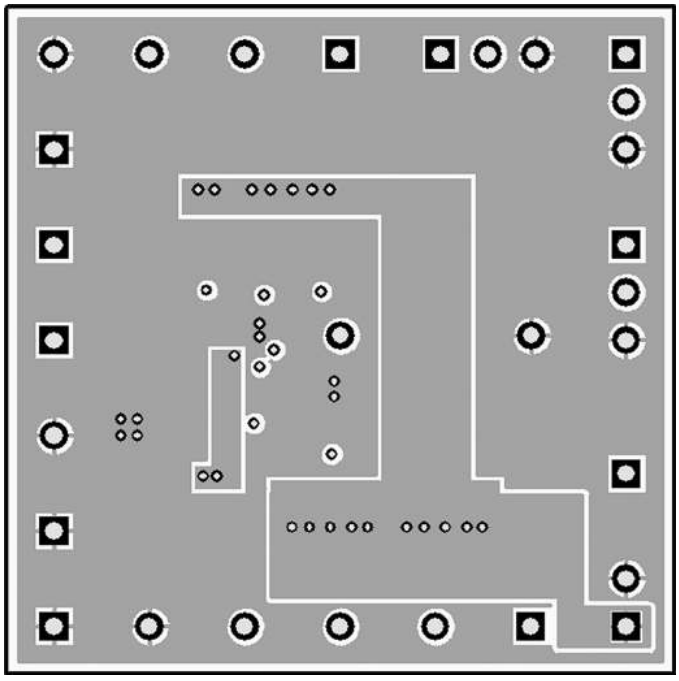


Figure 4. Bottom Layer (top view, unmirrored)

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