AL3158 Evaluation Module

HIGH EFFICIENCY CHARGE PUMP WHITE LED DRIVER

Device Features

- V_{IN} Range: 2.7V to 5.5V
- Up to 93% Max Power Efficiency
- 1% Current Matching Accuracy Between Channels
- Three Simple PWM Dimming for RGB or WLED
- Low Transition Threshold Voltage Typical 150 mV
- Dual-Mode 1x and 2x Charge Pump
- Drives up to 3 + 3 + 3 Channels of LEDs
- 1.2 MHz Constant Switching Frequency
- V_{OUT} Short-Circuit and Thermal Protections
- Soft Start for Reducing Inrush Current
- Under Voltage Lockout Protection
- I_Q <1μA in Shutdown
- Thermally-Enhanced QFN3030-20 Package: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/ RoHS Compliant

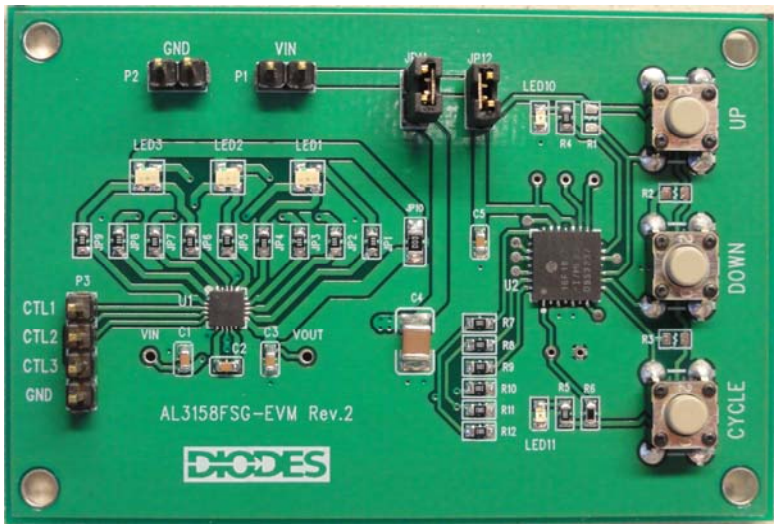
Description

The AL3158 is a low noise, constant frequency charge pump DC/DC converter that uses a dual-mode load switch (1x), and (2x) conversion for white LED applications. The AL3158 is capable of driving three groups of three LED channels at 20mA from a 2.7V to 5.5V input. The current sinks may be operated using three simple PWM dimming inputs individually or in parallel for driving higher current LEDs. Low external part counts (one 1μF flying capacitor and two 2.2μF capacitors at V_{IN} and V_{OUT}) make this part ideally suited for small, battery-powered applications.

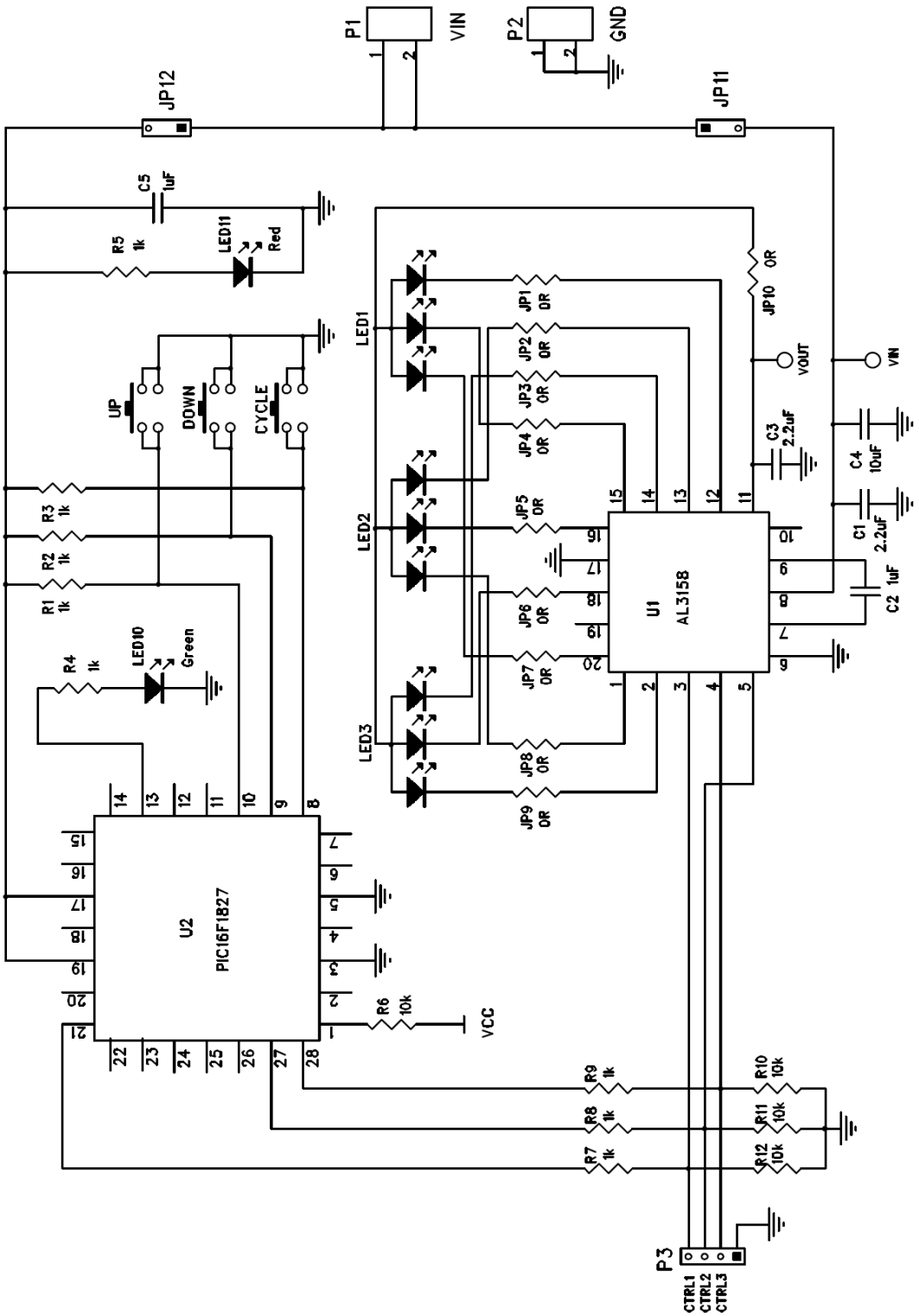
This evaluation board uses the AL3158's three PWM dimming inputs to enable and disable the device and to control the current level of R, G and B elements of the three color LEDs. Each PWM input controls three LEDs of the same color. The PWM signals are generated by an on-board microcontroller with three push buttons for adjusting current levels.

Ordering Information

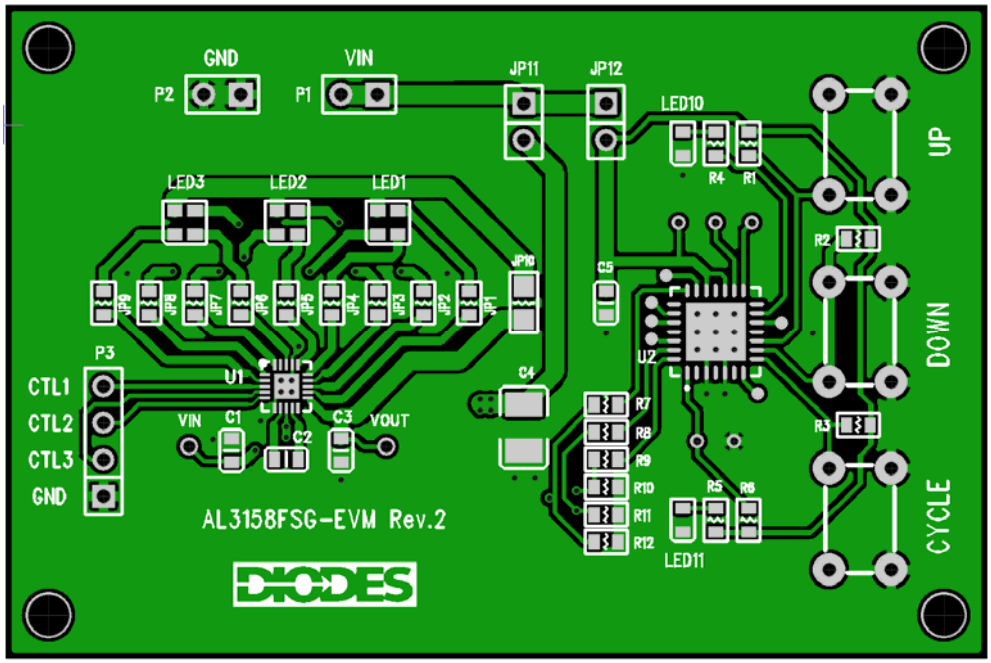
Device	Package Code	Packaging	EVM Part Number
AL3158FSG	FS	DFN3030-20	AL3158FSG-EVM Rev.2



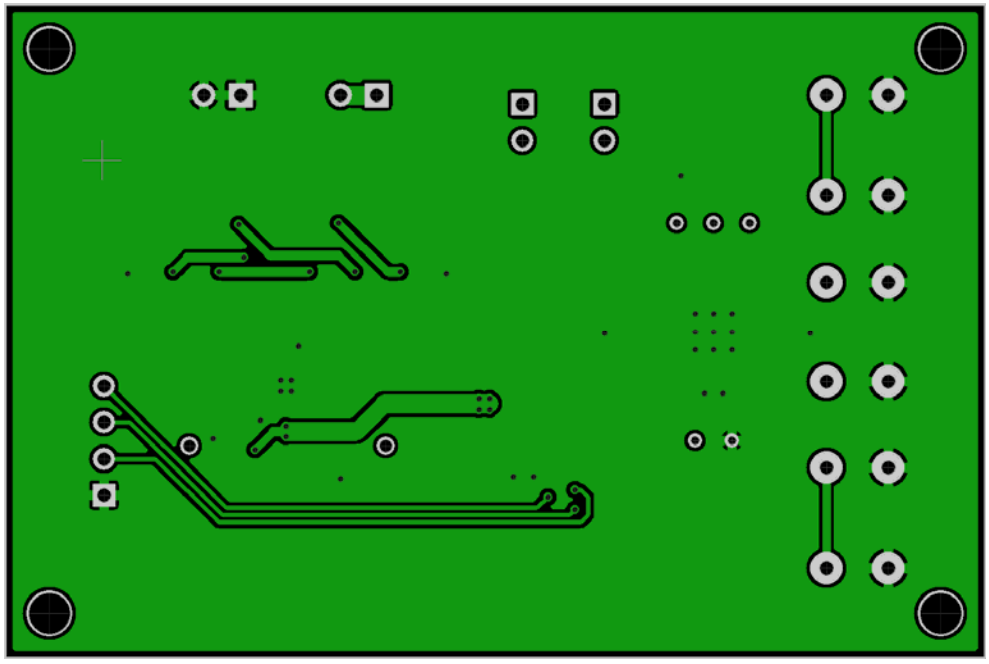
Schematic



PCB Layout



Top Layer Layout of AL3158FSG-EVM Rev.2



Bottom Layer Layout of AL3158FSG-EVM Rev.2

Bill of Material

Bill of Material for AL3158FSG-EVM Rev.2

Ref	Count	Size	Mfr	Part Number	Description
C1, C3	2	0603	STD	STD	2.2 µF/10V ceramic capacitor
C2, C5	2	0603	STD	STD	1 µF/16V ceramic capacitor
C4	1	1210	STD	STD	10 µF/10 ceramic capacitor
LED1-3	3	0805	STD	LTST-C19FD1WT	RGB color LED
LED10	1	0603	STD	STD	Green LED
LED11	1	0603	STD	STD	Red LED
JP1-9	9	0603	STD	STD	0 Ω resistor
JP10	1	0803	STD	STD	0 Ω resistor
R1-3	1	0603	STD	STD	Not populated
R4-5, 7-9	5	0603	STD	STD	1 kΩ resistor
R6	1	0603	STD	STD	10 kΩ resistor
R10-12	3	0603	STD	STD	100 kΩ resistor
U1	1	DFN3030-20	Diodes	AL3158SFG	Charge pump WLED driver
U2	1	QFN6060-28	Microchip	PIC16F1827	8-bit microcontroller

I/O Terminals and Test Points

Terminals and Jumpers for AL3158FSG-EVM Rev.2

I/O and Test Points	Description	Comments
P1 (VIN), P2 (GND)	Power Supply and Ground	Connect to input power supply
P3	Control signal monitoring	Use an oscilloscope to monitor the PWM signals
J11	Input Jumper to AL3158	Jumper for connecting V_{IN} to the AL3158
J12	Input Jumper to PWM control	Jumper for connecting V_{IN} PWM controller circuit
VIN, VOUT	Voltage Test Points	Input and output voltage test points

Quick Start Guide

1. Insert jumper J11 to connect VIN to the AL3158 and J12 to connect VIN to the onboard PWM controller.
2. Connect a +2.7V~+5.5V power supply between VIN (P1) and GND (P2) headers. Turn on the power supply. The red power indicator LED (LED11) will be on.
3. The PWM controller will enter State 1, where three different PWM signals are sent to the AL3158 to set the current levels of the three groups of LEDs, green, red and blue. Each group will be dimming from bright to dark and from dark to bright, causing LED1-3 to show changing colors.
4. In State 1, the green LED10 will be blinking. Pressing the UP and DOWN buttons will change the rate at which LED10 blinks and also change the dimming rate of the color LEDs.
5. Press the CYCLE button to move the PWM controller to the next state. Every time the controller enters a new state between States 2 and 4, the corresponding LED group will be dimming automatically while the other LEDs will stay at the current levels set in the previous States.
6. While in any state between State 2 and State 4, press the UP or DOWN button to stop auto-dimming. Then use the UP button to manually increase the brightness of the LEDs and DOWN button to decrease it. Press the CYCLE button again to resume auto-dimming of the same color.
7. Press the CYCLE button while in State 4 will bring the PWM controller back to State 1.
8. Press and hold the CYCLE button at any time will force the PWM controller to enter State 0. In this state, all color LEDs will be turned off. So will the green LED10. Press the CYCLE button in State 0 will change the PWM controller state to State 1 with all three color LED groups dimming in-synch, resulting in white color.
9. In order to see only one of the three colors, do the following: (1) Do step 8 and then enter State 1. (2) Follow step 4 to slow down the dimming rate. (3) Press the Cycle button while all color LEDs are off so that State 2-4 can be entered with the LEDs of only one color on.

Table: PWM Controller Machine States

Controller State	Green LED (LED10)	Description
0	Off	All RGB LEDs are turned off
1	Flashing	All three groups auto-dimming; UP and DOWN button to change dimming rate.
2	On	Set current level for the green LEDs in LED1-3
3	On	Set current level for the red LEDs in LED1-3
4	On	Set current level for the blue LEDs in LED1-3