

Introduction

The AAT1231 is a high frequency, high efficiency constant current boost converter driving up to six white LEDs in series or up to twelve white LEDs in parallel/series configuration. The input voltage is 2.7V to 5.5V, which is ideal for portable devices powered by single-cell lithium-ion/polymer (Li-ion) batteries. With over-voltage protection and dynamically-programmable voltage control via AnalogicTech's patented Simple Serial Control™ (S²Cwire™) interface, the AAT1231 is an ideal choice for white LED backlight applications.

The AAT1231 evaluation board provides a platform for test and evaluation of the AAT1231 for white LED backlight applications driving six LEDs. The AAT1231 is programmable with the S²Cwire interface, using an onboard microcontroller which is capable of brightening and dimming the LEDs in 26 discrete steps. The SELECT logic signal from the microcontroller provides a stepped load from 1.5x to 3.0x of nominal output current, depending on the S²Cwire data register (default = 3.0x).

This document describes the evaluation board and its accompanying user interface. In addition, a brief "Getting Started" section is included to help the user begin operating the evaluation board. A schematic of the complete circuit is shown in Figure 1. The board layout is also provided. For additional information, please refer to the AAT1231 product datasheet.

Schematic

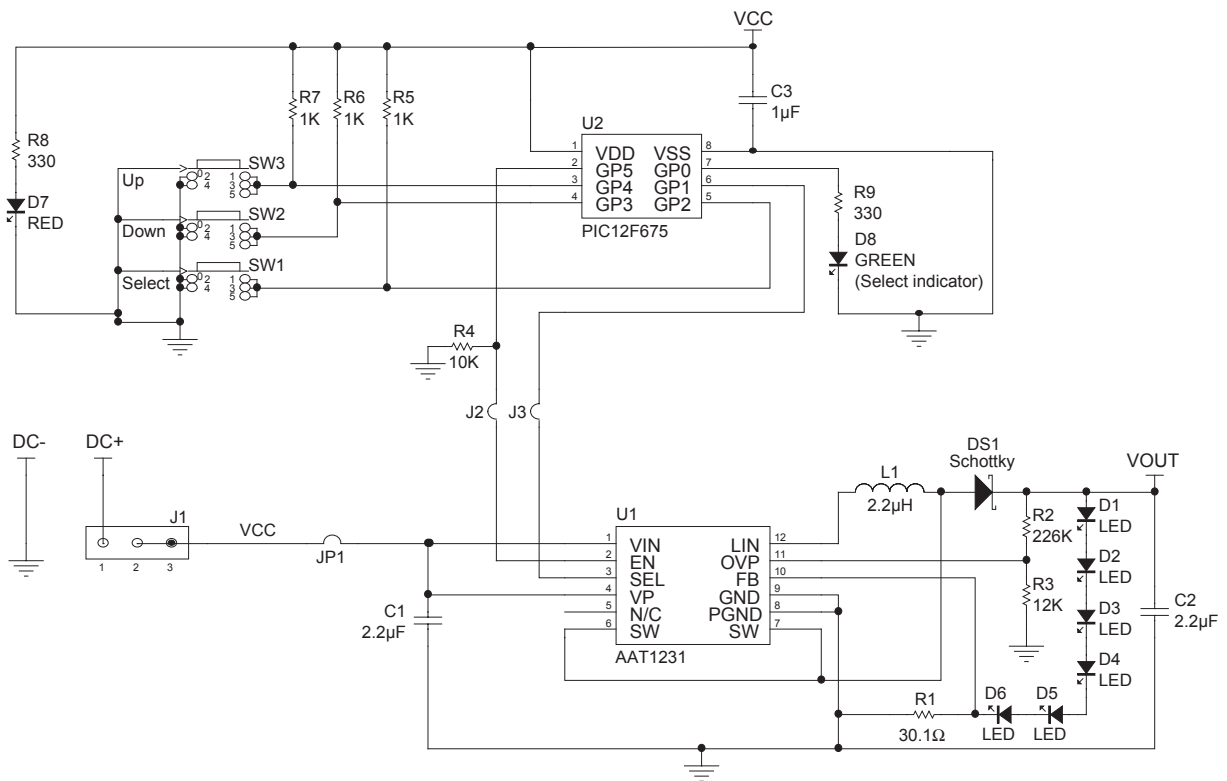


Figure 1: AAT1231 Evaluation Board Schematic with Six White LEDs and Microcontroller.

Getting Started

The ballast resistor (R1) is set to 30.1Ω on the evaluation board. This sets the maximum LED current to 20mA.

$$I_{LED} = \frac{V_{FB}}{R_1}$$

Over-voltage protection is set to the maximum operation voltage (24V) to protect the IC from damage.

There are three (3) buttons on the evaluation board. The modes of operation are detailed in Table 1. Each button controls a particular function. The SW1 (Up) button increments the number of EN/SET edges, and the AAT1231 increases the FB pin voltage according to Table 2. By holding down the Up button for more than 1.5 seconds, the microcontroller enters auto-increment mode. The SW2 (Down) button decrements the number of EN/SET edges and the AAT1231 decreases the FB pin voltage. By holding down the Down button for more than 1.5 seconds, the microcontroller enters auto-decrement mode. The SW3 (Select) button toggles High/Low on the SEL pin. A green LED (D8) indicates the status on the SEL pin. If the green LED turns ON, the SEL pin is set to High. If the green LED turns off, the SEL pin is set to Low. Figure 2 details the LED nominal current levels for SEL=High and SEL=Low settings with R1=30.1Ω.

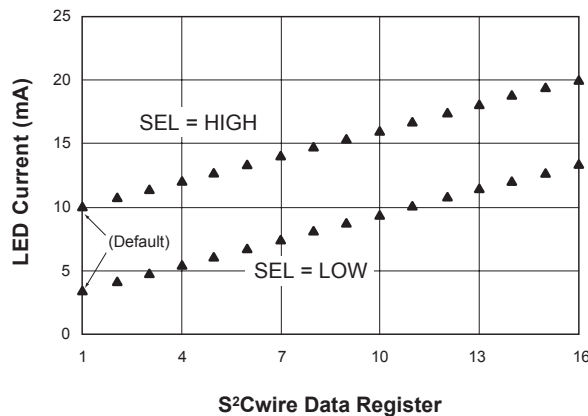


Figure 2: Programming LED Current with R_{BALLAST} = 30.1Ω.

Upon initial power-up and prior to S²Cwire programming, the default FB pin voltage is set at 0.1V/0.3V depending on the SEL pin logic level. The red LED (D7) should illuminate, indicating that power has been connected to the evaluation board.

User Interface Functionality

Button(s) Pushed	Description
SW1 (Up)	[Push/Release once] Increment the number of EN/SET edges. Toggles through the available brightness level settings for the backlighting section.
	[Holding 1.5 sec.+] Auto-increment one voltage level per second.
SW2 (Down)	[Push/Release once] Decrement the number of EN/SET edges. Toggles through the available dimming level settings for the backlighting section.
	[Holding 1.5 sec.+] Auto-decrement one voltage level per second.
SW3 (Select)	[Push/Release once] Toggles the SEL logic pin High/Low.

Table 1: User Interface Functionality.

Rising Clock Edges/Data Register	SEL = Low		SEL = High	
	Reference Voltage (V)	LED Current (mA); $R_{BALLAST} = 30.1\Omega$	Reference Voltage (V)	LED Current (mA); $R_{BALLAST} = 30.1\Omega$
1	0.1 (default)	3.32	0.3 (default)	9.97
2	0.12	3.99	0.32	10.63
3	0.14	4.65	0.34	11.30
4	0.16	5.32	0.36	11.96
5	0.18	5.98	0.38	12.62
6	0.20	6.64	0.40	13.29
7	0.22	7.31	0.42	13.95
8	0.24	7.97	0.44	14.62
9	0.26	8.64	0.46	15.28
10	0.28	9.30	0.48	15.95
11	0.30	9.97	0.50	16.61
12	0.32	10.63	0.52	17.28
13	0.34	11.30	0.54	17.94
14	0.36	11.96	0.56	18.60
15	0.38	12.62	0.58	19.27
16	0.40	13.29	0.60	19.93

Table 2: AAT1231 S²Cwired Reference Feedback Voltage Control Settings with $R_{BALLAST} = 30.1\Omega$ (Assume Nominal Values).

Printed Circuit Board

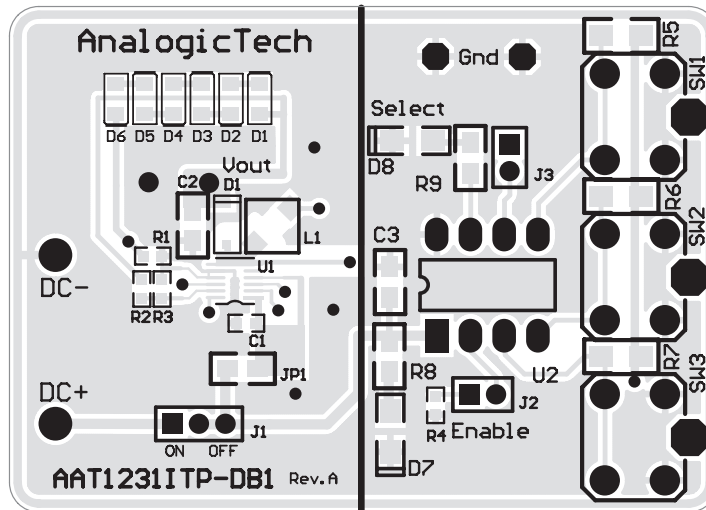


Figure 3: AAT1231 Evaluation Board Top Layer (not to scale).

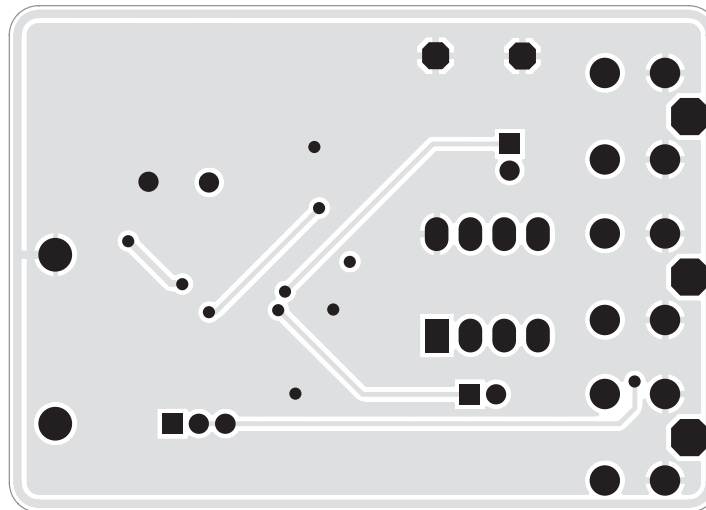


Figure 4: AAT1231 Evaluation Board Bottom Layer (not to scale).

AAT1231 EVAL Component Listing

Component	Part Number	Description	Manufacturer
U1	AAT1231	Step Up DC-DC Converter for White LED Backlight Applications; TSOPJW-12 Package	AnalogicTech
U2	PIC12F675	8-bit CMOS, FLASH-Based μ C; 8-Pin PDIP Package	Microchip
SW1 - SW3	PTS645TL50	Switch Tact, SPST, 5mm	ITT Industries
R1	Chip Resistor	30.1 Ω , 1%, 1/4W; 0603	Vishay
R2	Chip Resistor	226k Ω , 1%, 1/4W; 0603	Vishay
R3	Chip Resistor	12.1k Ω , 1%, 1/4W; 0603	Vishay
R4	Chip Resistor	10k Ω , 5%, 1/4W; 0603	Vishay
R5, R6, R7	Chip Resistor	1k Ω , 5%, 1/4W; 0805	Vishay
R8, R9	Chip Resistor	330 Ω , 5%, 1/4W; 0805	Vishay
JP1	Chip Resistor	0 Ω , 5%, 0805	Vishay
C1	GRM188R60J225KE01	2.2 μ F, 10V, X5R, 0603	MuRata
C2	GRM21BR71E225KA73	2.2 μ F, 25V, X7R, 0805	MuRata
C3	GRM216R61A105KA01	1 μ F, 10V, X5R, 0805	MuRata
L1	SD3814-2R2	2.2 μ H, Core Shield	Cooper Electronics; Coiltronics
DS1	BAT42W	Schottky Diode; $V_R = 30V$, $I_{FM} = 0.2A$ SOD-123	Diodes, Inc.
D1-D6	LW M673	White Hyper-Bright LED	OSRAM
D7	CMD15-21SRC/TR8	Red LED; 1206	Chicago Miniature Lamp
D8	CMD15-21VGC/TR8	Green LED; 1206	Chicago Miniature Lamp
J1, J2, J3	PRPN401PAEN	Connecting Header, 2mm Zip	Sullins Electronics

Table 3: AAT1231 Evaluation Board Component Listing.

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