Introduction

This document describes how to connect the I²C/S²Cwire controller board to the AAT1142 dynamically programmable DC/DC buck converter. The schematic and PCB drawing of the controller board, as well as the function of each button, is described. The I²C/S²Cwire controller board contains a microcontroller which provides the I²C and S²Cwire interface via a five-wire ribbon cable. This controller board works as a master device in either the I²C or S²Cwire system, while the AAT1142 slave device receives data and varies the AAT1142 output voltage in response to push-button commands. The microcontroller is programmed with one I²C slave address.

Getting Started

Figure 1 shows how to connect the I²C/S²Cwire controller board to the AAT1142 demo board. ESD protection (ground cable) is recommended to prevent unwanted ESD events.

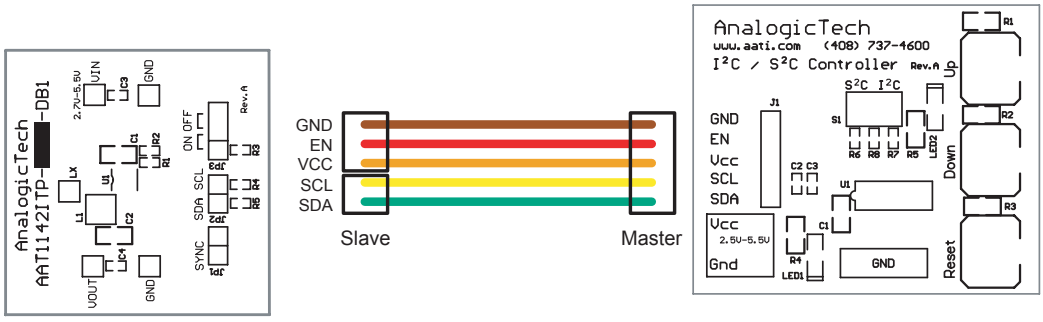

Figure 1: Connection of AAT1142 Demo Board and I²C/S²Cwire Controller Board.

There are three (3) buttons on the controller board. Selecting the 'Up' or 'Down' button blinks the green LED, indicating that the I²C or S²Cwire signal was successfully transmitted from the microcontroller. The output voltage level of the AAT1142 responds by adjusting the AAT1142 demo board output voltage in ±50mV increments. By holding the 'Up' or 'Down' button, the voltage level is auto-incremented and auto-decremented within the AAT1142 specified operating voltage range (please refer to the AAT1142 datasheet). Selecting the 'Up' or 'Down' button at the voltage extremes returns the output to the lowest or highest voltage level, respectively. The 'Reset' button sets the output voltage level to the lowest setting.

There is a toggle switch on the controller board that switches between the I²C and S²Cwire communication protocols. When the switch is in the left position, the S²Cwire protocol is implemented via the EN pin. When the switch is in the right position, the I²C protocol is implemented via the SCL and SDA pins. It can be switched at any time, as the microcontroller has auto-detection capability.

Upon initial power-up and prior to I²C or S²Cwire programming, the default output voltage of the AAT1142 is set at 1.8V. The input DC voltage range of the I²C/S²Cwire controller board and AAT1142 demo board is 2.7V to 5.5V. On/Off control of the AAT1142 demo board using I²C interface is accomplished by applying or removing DC input voltage.

Pinouts

Connection

The five-wire ribbon cable connector is a standard 0.1-inch (2.54mm) pitch. One end has a five-header connector and the other end has two connectors (three-header and two-header). The five-header connector should connect to the controller board. The three-header and two-header are connected to the AAT1142 demo board in the orientation shown in Figure 1.

Order of Leads

1. GND
2. EN
3. VCC
4. SCL
5. SDA

Ground Pin

It is imperative that the controller board be on a common ground with the slave board. If the ground is not connected, the signaling is entirely unpredictable and communication will likely be corrupted.

VCC Pin

VCC is the power for the master system and the voltage range is from 2.7V to 5.5V. The DC source powers both the I²C/S²Cwire controller board and AAT1142 demo board.

I²C Pins

SCL (Serial Clock line): the signal used to synchronize communication between the master and the slave.

SDA (Serial Data line): the signal used to transfer data between the transmitter and the receiver.

EN Pin

EN (EN/SET): When using the I²C protocol interface, this EN pin provides logic high to enable the demo board device. When using the S²Cwire protocol interface, the demo board provides clock edges. (Please refer to the AAT1142 product datasheet for more information.)

Pull-Up Resistors

There is a 4.7kΩ resistor on each I²C line (SCL, SDA) and S²Cwire enable (EN) pins. These pins are effectively pulled up to the V_{CC} input rail, resulting in approximately 1mA of pull-up current. The I²C specification allows for a maximum of 3mA pull-up current on each I²C line.

External Power Source

This controller board can be powered either from the AAT1142 demo board through the ribbon cable[1] or from a separate power supply. To use a separate external power source, simply disconnect the VCC pin from the controller board, then connect an external power supply to the power post. The input voltage of the controller board can be in the range of 2.5V to 5.5V. For detailed information regarding the V_{IL} or V_{IH} level of the I²C bus, please read the I²C specification or refer to the Electrical Characteristic table in the AAT1142 product datasheet.

I²C and S²Cwire Switch

This switch changes the communication protocol between I²C and S²Cwire.

Button(s) Pushed	Description
Up (SW1)	[Push/Release once] Increment +50mV output voltage level.
	[Holding 1.5 sec.+] Auto-increment one voltage level per second.
Down (SW2)	[Push/Release once] Decrement -50mV output voltage level.
	[Holding 1.5 sec.+] Auto-decrement one voltage level per second.
Reset (SW3)	[Push/Release once at I²C mode] Set to the lowest voltage level (0.6V).
	[Push/Release once at S²Cwire mode] Set to the lowest voltage level of S²Cwire (0.65V).
	[Holding 1.5 sec. at S²Cwire mode] Disables output, disabling DC output[2] (0V), and then return to lowest voltage level of S²Cwire (0.65V).

Table 1: User Interface Functionality.

1. When using the common power source, R3 on the AAT1142 demo board must be shorted.
2. On/Off control using the I²C interface is accomplished by applying or removing the DC input voltage.

Schematic

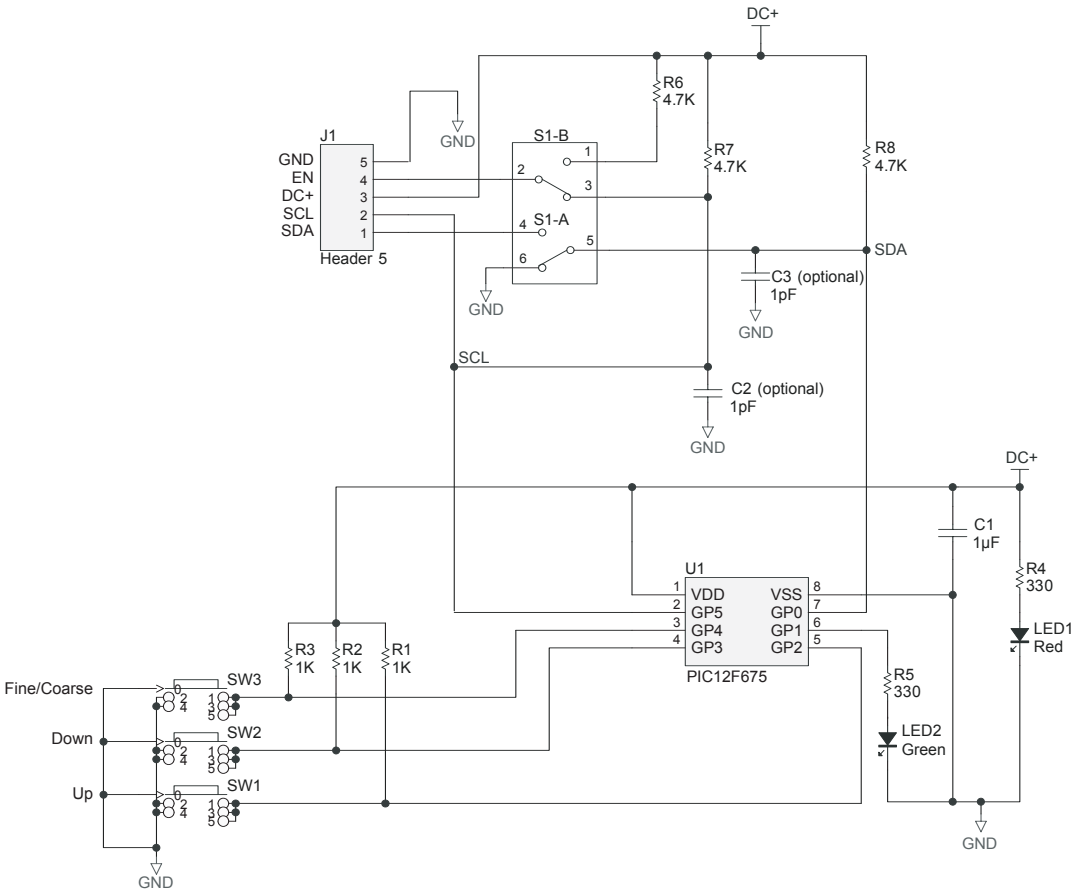

Figure 2: I²C/S²Cwire Controller Board Schematic.

Printed Circuit Board

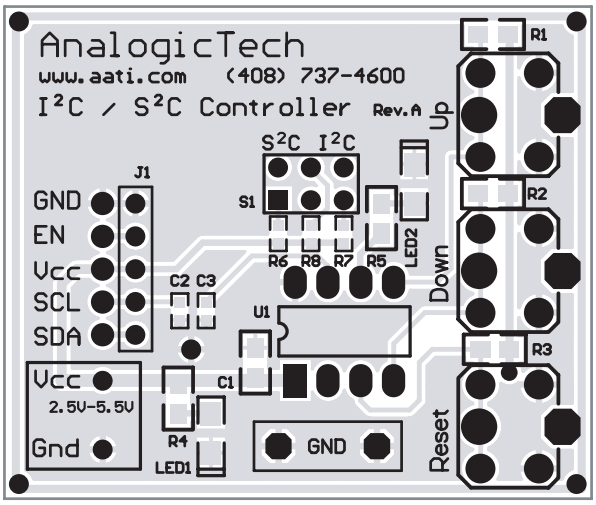

Figure 3: Top Layer (not to scale).

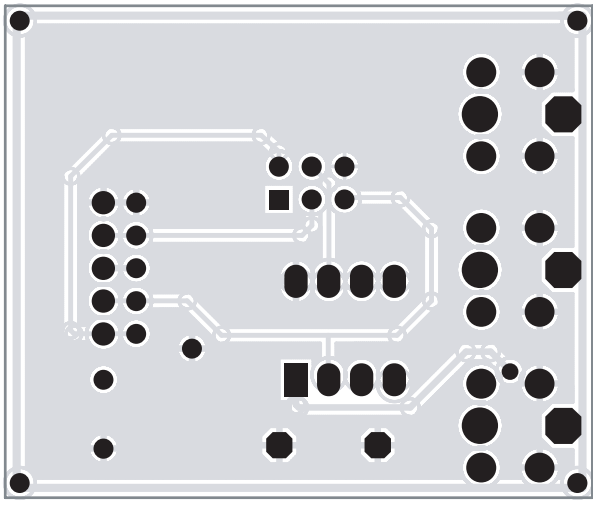

Figure 4: Bottom Layer (not to scale).

Bill of Materials

Component	Part#	Description	Manufacturer
U1	PIC12F675	8-bit CMOS, FLASH-based µC; 8-pin PDIP Package	Microchip
SW1 - SW3	PTS645TL50	Switch Tact, SPST, 5mm	ITT Industries
R1, R2, R3	Chip Resistor	1kΩ, 5%, 1/4W; 0805	Vishay
R4, R5	Chip Resistor	330Ω, 5%, 1/4W; 0805	Vishay
R6, R7, R8	Chip Resistor	4.7kΩ, 5%, 1/4W; 0805	Vishay
C2, C3	VJ0603A1R0CXACW1BC	1pF, 50V, C0G, 0603	Vishay
C1	GRM216R61A105KA01	1µF, 10V, X5R, 0805	MuRata
S1	GT21MCBE	Toggle Switch, DPDT	ITT Industries
LED1	CMD15-21SRC/TR8	Red LED; 1206	Chicago Miniature Lamp
LED2	CMD15-21VGC/TR8	Green LED; 1206	Chicago Miniature Lamp
J1	PRPN401PAEN	Conn. Header, 2mm zip	Sullins Electronics

Table 2: I²C/S²Cwire Controller Board Component Listing.

Advanced Analogic Technologies, Inc.
830 E. Arques Avenue, Sunnyvale, CA 94085
Phone (408) 737-4600
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