ISL9216EVAL1

Evaluation Board

AN1335
Rev 0.00
October 10, 2007

The ISL9216EVAL1 kit is intended for use by individuals engaged in the development of battery pack hardware using the ISL9216, ISL9217 chip set.

The evaluation kit consists of a main board and a USB to I^2C board. An optional link between the PC and the microcontroller BKGD connector is available from NXP (formerly Freescale) for monitoring and debugging the microcontroller code.

Prior to powering the ISL9216 board, it is advised that the DeVaSys USB to I^2C board software be installed and the board connected to the PC. See "Appendix 1" on page 16. In this way, the PC interface can quickly be used to monitor the operation of the board.

Initial Testing

Setup

- For initial testing, set the I^2C jumpers (SCL and SDA) to the PC position. This configures the board such that the PC communicates directly with the ISL9216.
- Before connecting the PC to the ISL9216EVAL1 board (through the USB to I^2C interface), connect the power supply to the ISL9216EVAL1 board.
- The power supply should consist of a string of 8 to 12 batteries, or a string of 8 to 12 resistors with three power supplies, or 12 individual power supplies (see Figure 2 or Figure 3).
- Once power is turned on (or Li-ion cells are connected to the ISL9216EVAL1 cell inputs; (the RGO and RGO2 LEDs should light) use meter 1 and meter 2 to measure the RGO voltages. They should each read about 3.3V.

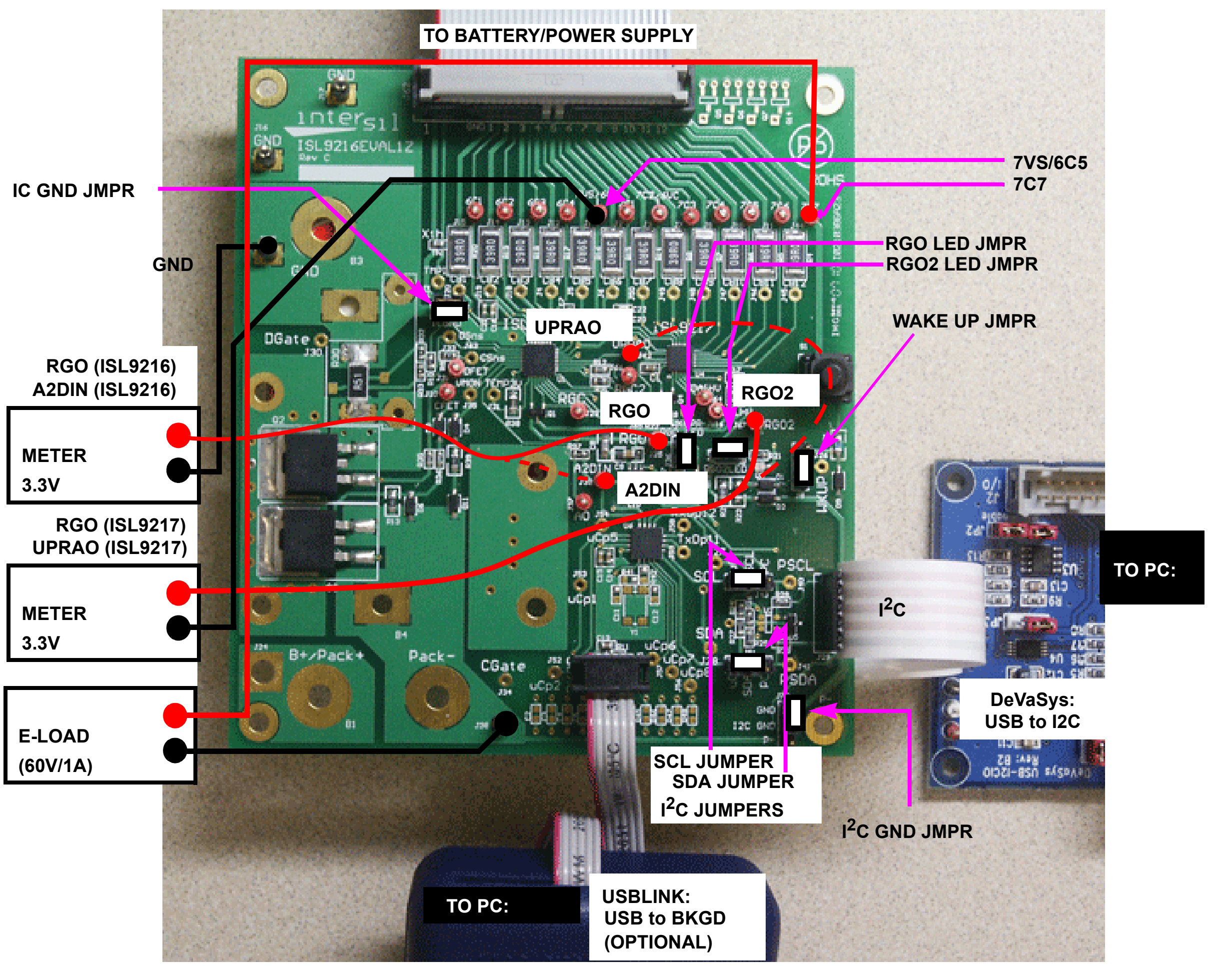


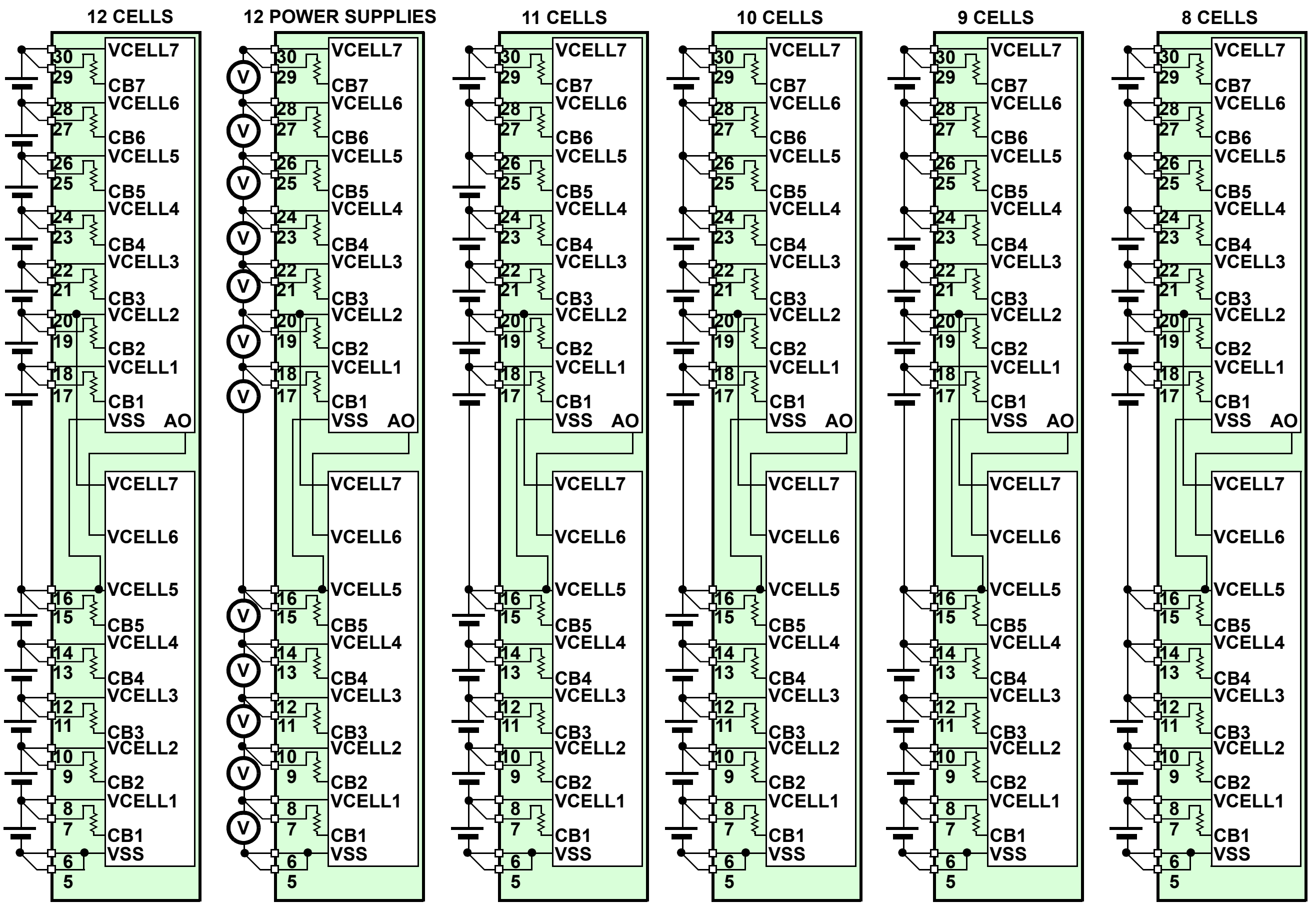
FIGURE 1. ISL9208EVAL1 BOARD CONNECTION

Battery/Power Supply Connection

When connecting battery packs or power supplies, use the connections shown in Figure 2 and Figure 3. If individual power supplies are being used to replace battery cells, then connect the power supplies identically to the battery connections (see Figure 2). Also, make sure that the individual power supply voltages do not exceed the ISL9216, ISL9217 maximum input voltage differential of 5V per cell.

If using a string of resistors to emulate the battery cells, then use the connection shown in Figure 3 and Figure 6. In this case, limit the supply voltages so that the resistor divider outputs do not exceed the ISL9216, ISL9217 input maximum ratings.

It is recommended that the series resistors be 20Ω and 2W minimum. Resistors with higher resistance can be used, but when activating the ISL9216, ISL9217 cell balance outputs, the 40Ω cell balance resistor will lower the voltage across that series power supply resistor, while raising the voltage on all of the other series resistors. Turning on multiple cell balance outputs could then result in one or more of the VCELLN input voltages exceeding their maximum specified limit.



NOTE: Multiple cells can be connected in parallel

FIGURE 2. BATTERY CONNECTION OPTIONS

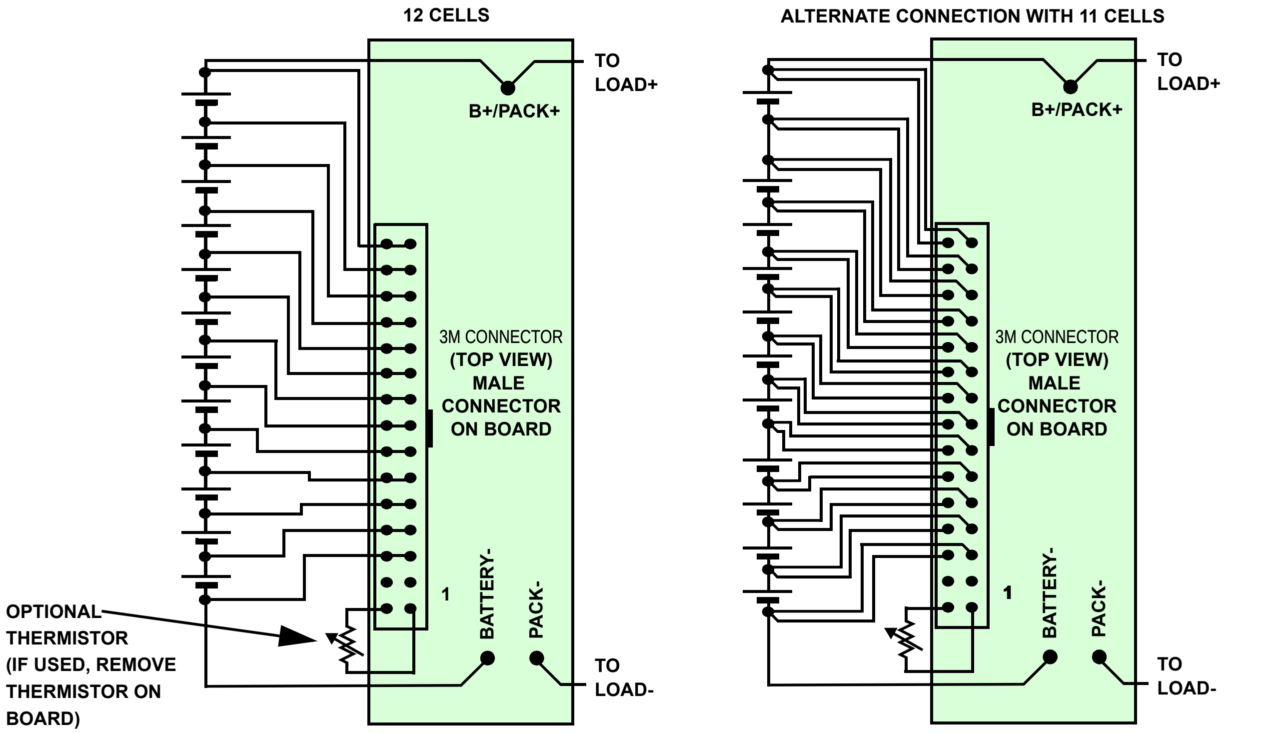


FIGURE 3. BATTERY CELL CONNECTION TO ISL9216 PCB

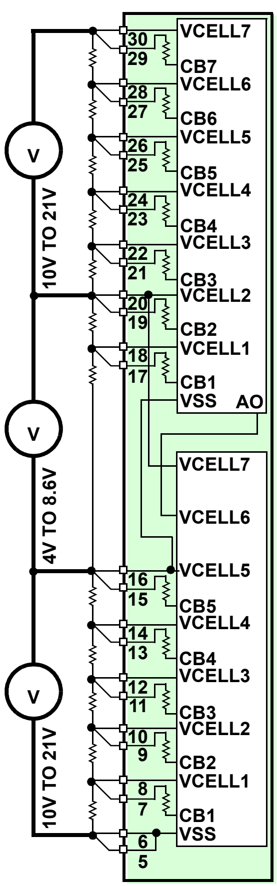


FIGURE 4. USING RESISTOR/POWER SUPPLY COMBINATION TO EMULATE A STRING OF BATTERIES

NOTES:

1. For the battery simulation resistors, use 20Ω/5W units. If the resistors are more than 100Ω, then turning on the cell balance resistors cause fluctuations in the cell input voltages that can violate the ISL9216 max specifications.
2. Switch the power supplies on at the same time, or if this cannot be guaranteed, turn them on from bottom to top.
3. This connection (using 3 power supplies) is required for proper inter-IC communication.

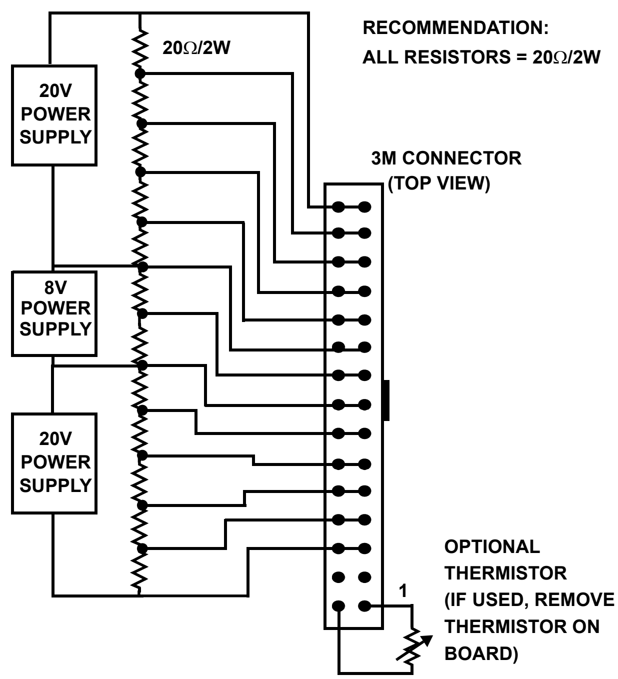


FIGURE 5. POWER SUPPLY/RESISTOR CONNECTION TO ISL9216 PCB

USB to I^2C Interface

- Once the power supply connections are verified, power down the ISL9216EVAL1 boards and make the PC connection. Before making this connection, make sure that the USB to I^2C interface software is installed. See

"Installing the DeVaSys USB to I^2C Board Software" on page 16.

- Connect the I^2C communication cable from the interface board to the ISL9216EVAL1 as shown in Figure 6.

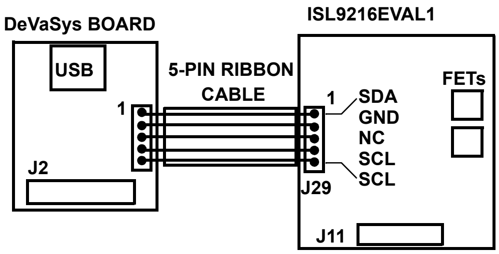


FIGURE 6. I^2C CONNECTION TO ISL9216 PCB

Testing without the Microcontroller

Cell Voltage Monitor Accuracy Check

- For this test, make sure the SCL and SDA jumpers are set to the PC position. In this case, the PC has full control of the board and the microcontroller function is disabled. (See Figure 7). Except for the ISL9216 automatic response to overcurrent and over-temperature, all other actions of the board are manual and controlled through the GUI..

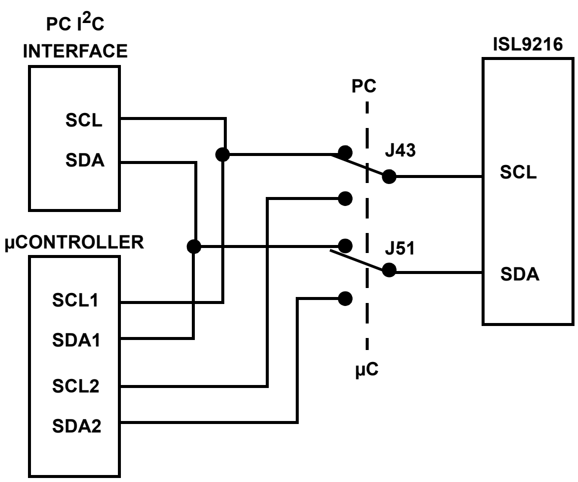


FIGURE 7. PC OR µC CONNECTION TO THE ISL9216

- Make the I^2C port connection to the PC
- Power up the board and re-check the RGO voltages. Since RGO is the voltage reference for the on-board A/D converter, this voltage may be needed in the accuracy calculations.
- Start the GUI. Execute the program BATTERYPACK.EXE from the Software directory.
- The GUI should power-up with some color. That is, the FET controls should be RED and the indicators should be green or red. If the GUI is all gray, then there is a communication problem. If there is a communication problem, see the troubleshooting guide in "Appendix 2" on page 17.
- Use the GUI to read register 0 from both the ISL9216 and ISL9217. The ISL9216 should return the value 40H and the ISL9217 should return 80H. This verifies communication to both devices.
- Next, move to the "MONITOR" tab of the GUI.
- Set the ISL9216 to monitor the VCELL1 input by selecting the ISL9216 radio button and choosing VCELL1 in the Monitor drop down box. Execute this command by clicking "refresh." This operation connects the VCELL1 input to the AO output (through a level shifter and divider). Any changes on VCELL1 appear on AO.
- Using a meter, measure the CELL1 voltage (from test point 6C1 to GND) and measure the ISL9216 analog output voltage (test point AO to GND). The AO voltage x 2 should equal the VCELL1 voltage. Any errors in this measurement are due to the ISL9216. (Note: make sure that all of the cell balance outputs are off, because cell balance current will cause inaccurate measurements).
- Also, read the GUI value for CELL1. In this configuration (without the µC) the cell voltage is converted to digital using a 15-bit A/D converter. Its output is determined by Equation 1:

$$\frac{\text{DigValue}_D}{32768} \times 3.3 = \text{A2DIN} \qquad \text{(EQ. 1)}$$

Since, the reference for the A/D converter is supplied by the ISL9216 RGO voltage, any difference in the RGO voltage and 3.3V turns up as an accuracy error.

- Proceed, in sequence, to read the AO voltage for each cell connected to the ISL9216.
- To monitor the voltages of the cells connected to the ISL9217, first set the ISL9216 to read VCELL6. Then, set the ISL9217 to read VCELL1. In this case, the ISL9216 AO voltage is a reflection of the ISL9217 VCELL1 voltage. The VCELL1 voltage is shifted within the ISL9217 divided by 2 and applied to the ISL9217 AO pin. The ISL9217 AO pin connects to the ISL9216 VCELL6 pin and the voltage is level shifted again to ground reference. It is not divided within the ISL9216. The voltage at AO times 2 should equal the ISL9217:CELL1 voltage. Any errors are due to the inaccuracies in the ISL9216 and ISL9217 devices.
- Monitor the remaining cells connected to the ISL9217 by selecting (with the GUI) the individual ISL9217 cells. (Keep the ISL9216 set to monitor VCELL6).

Discharge Overcurrent Testing

- With the output off, connect an electronic load between Test Point 7C7 (Battery + terminal) and P- (Battery -

terminal). The E-load should be able to handle up to 60V and sink 1A minimum.

- Use the GUI “CONFIGURATION” screen to set the desired discharge overcurrent and short circuit levels and time delays.
- To test overcurrent, a pulse load or a continuous load can be used. A continuous load has the advantage of showing the load monitor operation.
- Set the e-load current such that it will exceed the expected overcurrent threshold.
- Turn on both FETs by clicking on the FET buttons in the GUI. When they are on, they will indicate GREEN. Periodically click on the “Status Refresh” button on the lower right of the screen to make sure that the GUI reflects the latest status of the device. (An automatic scan can also be started that updates all parameters every 1, 5, 10, or 30s, however, this might cause an update when not expected).
- Turn on the load. This should cause the FETs to turn off (see Figure 8).

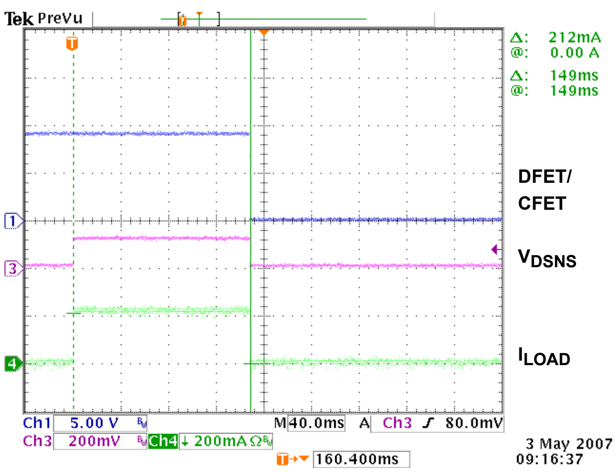


FIGURE 8. DISCHARGE OVERCURRENT TEST (0.1V THRESHOLD, 160ms TIME DELAY, 0.5Ω SENSE RESISTOR)

- Do a refresh of the GUI and the FET buttons should have gone to RED. Also, the “Discharge Overcurrent” indicator should now be red.
- Leave the load on and click on the “Enable Load Monitor” button in the lower right corner of the screen. This turns on the load monitor output.
- Click on the “Status Refresh” button. In this case, the “Load Fail” indicator should now also be red.
- Turn off or remove the load and again click on “Status Refresh”. The “Load Fail” indicator should go to green. Click on the “Reset Overcurrent” button to reset the “Discharge Overcurrent” indicator. It should also go to green. If the indicators are still red, it is because the remaining resistance on the load keeps the voltage on the ISL9216 load monitor (VMON) pin above its input threshold. Try disconnecting the load.
- Note: In the GUI, the discharge overcurrent, discharge short circuit, and charge overcurrent indicators are latched by the GUI. Internal to the ISL9216, the bit is reset by a read (if the condition has been resolved). The GUI latch is provided, because the overcurrent condition goes away as soon as the FETs turn off and the bits in the ISL9216 are reset by reading the registers. So, without the latch, the indicator would not stay on long enough for the user to monitor. Reset the latch by clicking on the “Clear Overcurrent” button.

Charge Overcurrent Testing

- Turn off the power to the board.
- Remove any load on the board Pack+ and Pack- pins.
- Turn on the ISL9216 board power supply (or connect the Li-ion cells to the pack).
- Use the GUI “CONFIGURATION” screen to set the desired charge overcurrent level and time delay.
- Turn on both FETs by clicking on the FET buttons in the GUI. When they are on, they will indicate GREEN. Periodically click on the “Status Refresh” button on the lower right of the screen to make sure that the GUI reflects the latest status of the device.
- Use another power supply for charge emulation. With the output off and not connected to the board, set the output to just over the chosen overcurrent detect voltage threshold. (This supply should have a 1.5A limit, but will only need to provide 0.2V max).
- Connect the charge emulation power supply positive terminal to the board GND pin and the charge emulation power supply negative terminal connected to the board P- pin. See Figure 9. A current probe can be used to monitor the overcurrent details.

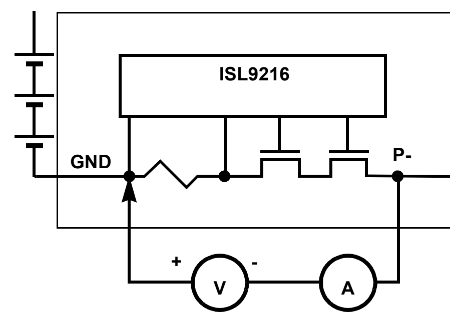


FIGURE 9. CHARGE OVERCURRENT TEST CONNECTION

- Turn the charge emulation power supply output on. This causes the ISL9216 to detect an overcurrent condition, which turns the FETs off. Figure 10 shows a charge overcurrent condition where the charger turns on with current too high.

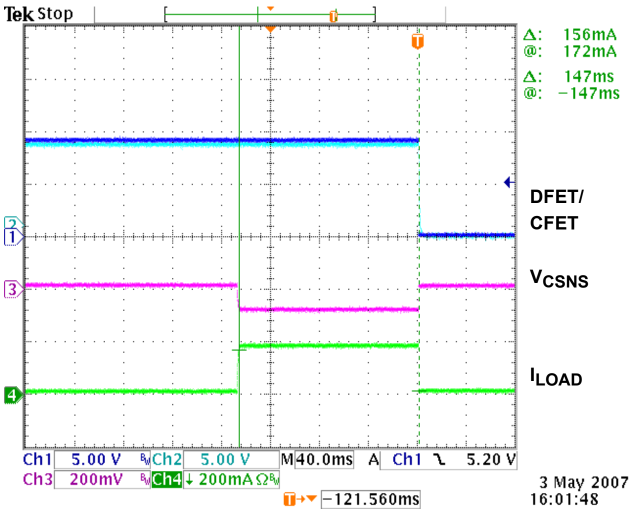


FIGURE 10. CHARGE OVERCURRENT TEST (0.1V THRESHOLD, 160ms TIME DELAY, 0.5Ω SENSE RESISTOR)

- The charge emulation power supply could have been connected across the Pack output pins (as in a "real world" operation). However, both the load and input power supplies need to sink current, the output supply would need to be floating when turned off (not shorted), and the load supply would need to handle a higher voltage than the input.

Sleep/Wake Testing (Default Setting - WKPOL= 0)

The ISL9216 board can be put to sleep via commands from the PC. This sequence is described in the following paragraphs.

- Use the Register Access window of the GUI to write the value 80H to register 4 of the ISL9217. This sets the ISL9217 sleep bit.
- Note that the RGO2 LED goes off. This indicates that ISL9217 has gone to sleep and turned off its output regulator.
- Next, click on the ISL9208, ISL9216 Cell Balance CB6 box. This sets the ISL9216 WKUPR output low. This wakes up the ISL9217 causing the regulator to turn on, lighting the RGO2 LED. Click on the ISL9208, ISL9216 CB6 box again to turn off the WKUPR signal.
- To put the ISL9216 into the sleep mode, write an 80H to the ISL9216 register 4. This turns off the ISL9216 RGO output and LED.
- To wake up the ISL9216 requires that the ISL9216 WKUP pin go below its wakeup threshold. Normally, in a pack, a charger would be connected to the pack terminals. The higher voltage on the charger would pull the WKUP pin low, causing the part to wake up. However, in a test setup, it is not always advisable to connect the charger. Another way to do this is to connect a jumper from GND to the WKUP pin. When using this technique, don't leave the jumper in place.
- When the WKUP pin is pulled low, the ISL9216 wakes up and turns on its RGO output. This turns on the RGO LED.

Sleep/Wake Testing (WKPOL = 1)

- This section only applies to the ISL9216. DON'T set the ISL9217 WKPOL bit to "1", or the device will not wakeup once placed into the sleep mode. (Power cycling would be required to wake it up).
- Set the WKUP jumper to the active high position (shunt on the side closest to the push-button switch).
- Use the GUI to set the "WKUP Pin Active High" in the Configure Tab, feature set window.
- Put the ISL9216 in sleep mode as before.
- This time, the device can be waken by the press of the WKUP button on the board.

Testing with the Microcontroller

- To operate the board using the microcontroller, power down the board
- Set the I^2C jumpers to the µC position.
- Power up the board and restart the GUI. Now, the PC will be communicating with the microcontroller and the microcontroller will be communicating with the ISL9216.
- The GUI should power up with some color. In this case, the FET controls should be GREEN and the indicators should be green or red. If the GUI is all gray, then there is a communication problem. If there is a communication problem, see the troubleshooting guide in "Appendix 2" on page 17.
- If the FET indicators are RED, then it is likely that at least one input voltage is out of range.

With the microcontroller in place, the board performs a number of automatic functions. They are:

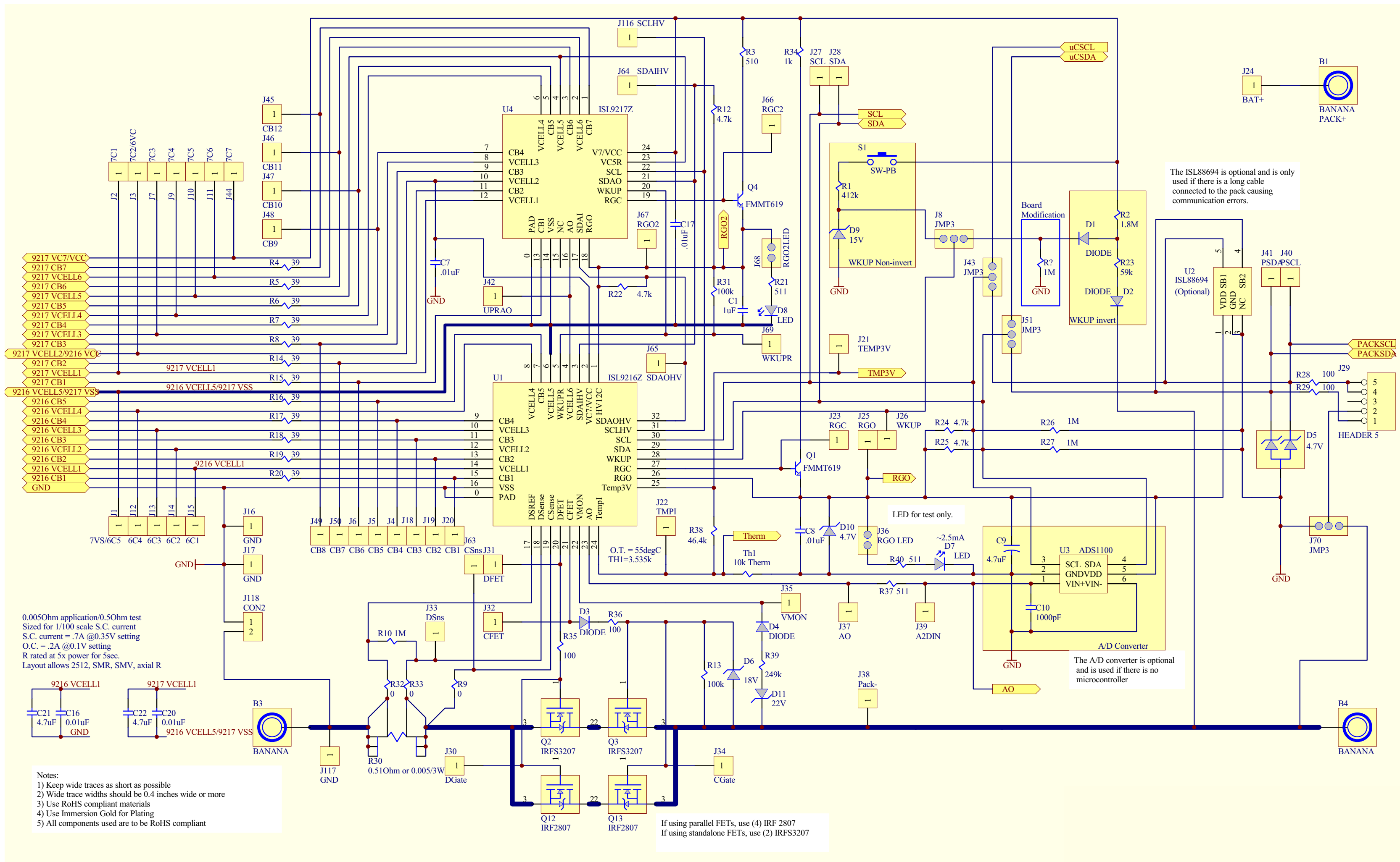
1. The cell inputs are monitored for too high or too low voltage. If any of the cell voltages go too high, the charge FET is turned off. If any of the cell voltages go too low, the discharge FET turns off. When the voltage recovers from these excursions back into the normal range, the FETs automatically turn on.
2. After an overcurrent condition, the microcontroller monitors the load and turns the FETs back on when the load is released.
3. The microcontroller monitors the temperature and turns off the cell balance if the temperature is too high or low.
4. The microcontroller performs cell balancing (once it is enabled through the GUI).
5. The microcontroller monitors the cell voltages and reports these voltages to the GUI. The microcontroller A/D

converter accuracy is only 10-bits, so the voltage reading are not as accurate as when using only the PC interface.

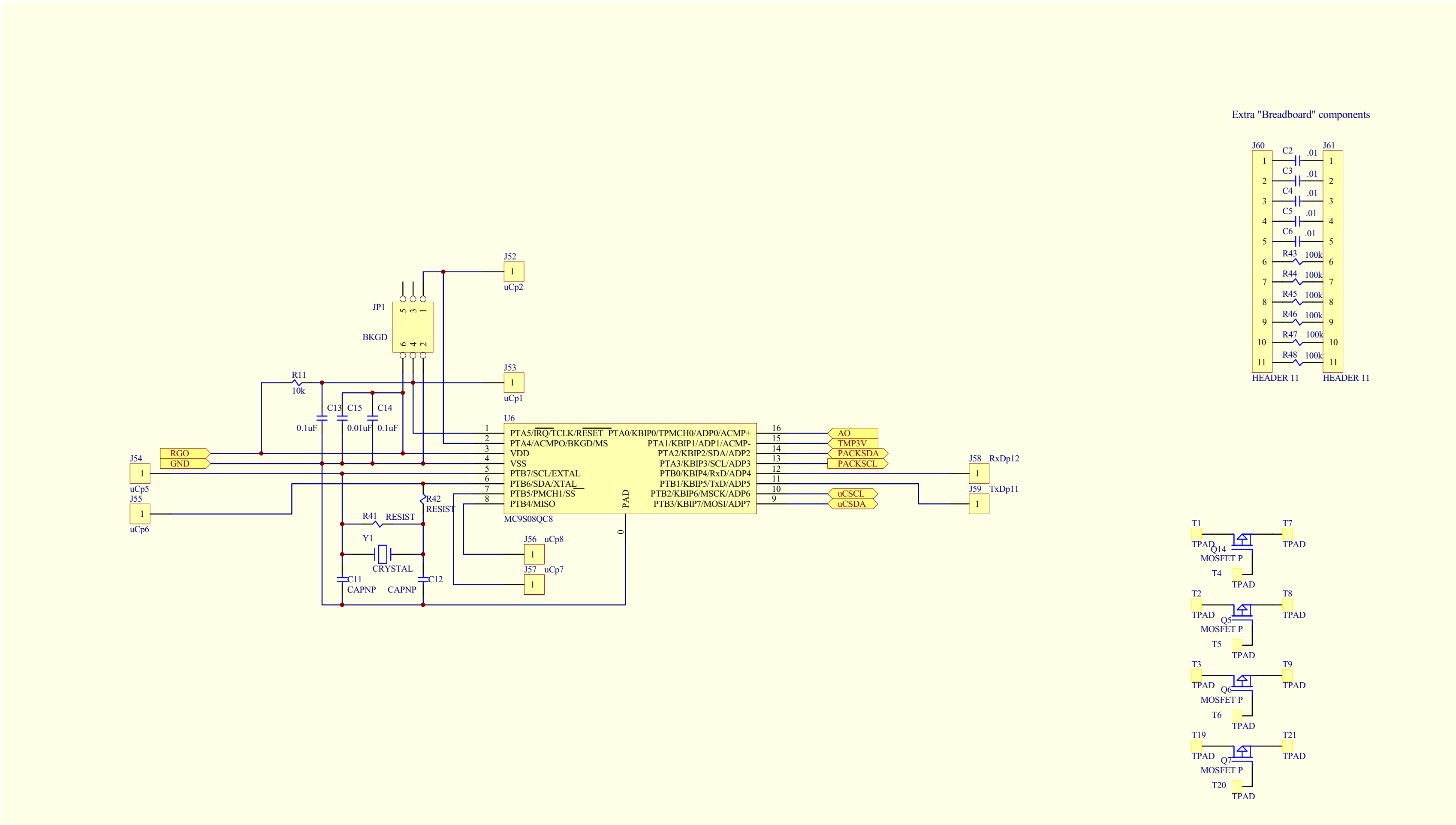
- Test the overvoltage and undervoltage conditions by:
  - If Li-ion cells are being used, discharge the pack until one or more of the cells reach the undervoltage limit and the discharge FET turns off. Then, charge the pack until the FETs turn on again and continue charging until a cell overvoltage condition is reached.
  - If one the three power supplies with resistor string is being used, lower the voltage on one of the power supplies until one or more of the cells reach the undervoltage limit and the discharge FET turns off. Then, increase the voltage until the FETs turn on again and continue increasing the voltage until a cell overvoltage condition is reached.
  - If twelve power supplies are used, then simply decrease or increase each individual supply until the thresholds are reached and the FET turns off (or on).
- Test the overcurrent in the same way as before, but this time, when the load is removed, the FETs should automatically turn back on. In this case, with the microcontroller operating, the status indicators in the GUI may not prove to be very useful because the microcontroller is often doing things too quickly to display on the screen.
- Testing the cell balance operation requires the use of Li-ion cells or the replacement of the cell balance resistors with lower resistance devices. With the suggested resistor string, turning on one cell balance output will likely drop the voltage on that cell to less than the 2.5V sleep threshold and the microcontroller will put the ISL9216 and ISL9217 (and the board) to sleep.
- Start the cell balance test by first observing if the cell with the maximum voltage exceeds the cell with the minimum voltage by more than 30mV. If so, note the cell number of the maximum voltage cell.
- Next, select “CB Max #” to be “1”. This limits the balancing to only one cell - the one with the maximum voltage.
- Use the CB refresh button (or start auto update) to update the indicators to see which cell is being balanced (it should be the maximum voltage cell). Be patient, because the microcontroller will balance for 10s, then turn off balancing for 2s, then balance again. Also, if the maximum voltage cell is very close to the next highest voltage cell, or if there are many cells within a narrow voltage range, then any of these cells could be balanced due to the limited accuracy of the microcontroller A/D converter.
- Next, select “CB Max #” to be “2”. This limits the balancing to two cells (the highest two voltage cells). Again refresh the CB screen periodically to see the operation of the cell balance code.
- Open the pack tab in the GUI and change some of the settings for overvoltage, undervoltage, or cell balance and re-test. Remember to click on “Write” to send the new parameters to the microcontroller.

Further tests on the board will likely follow the lines of battery pack testing, so it can become quite involved and be very specific to the application. Therefore, before setting up the tests, see the “GUI user Manual” for information on using the interface and see the “Microcode Reference Guide” for information about how the software works.

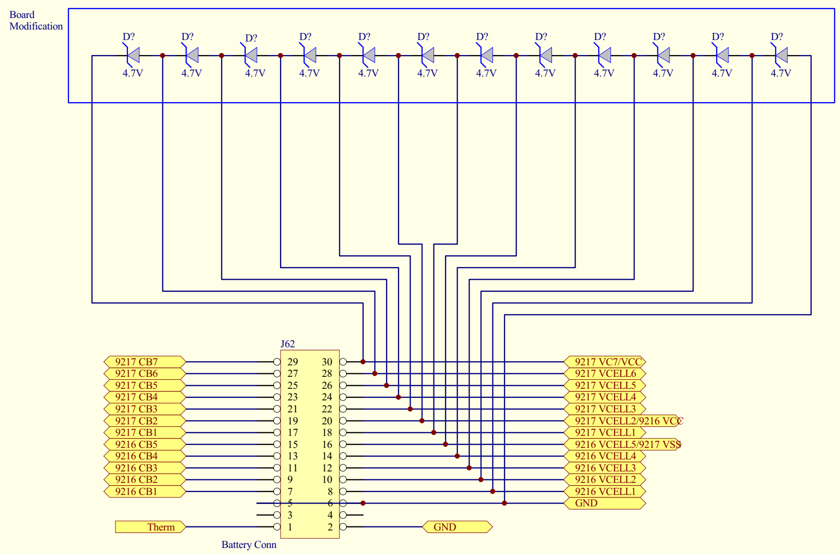
AFE Schematic



Microcontroller Schematic



Battery Connection Schematic



Bill of Materials

ITEM	QTY	PART TYPE	DESIGNATOR	FOOTPRINT	DESCRIPTION	PART FIELD 1
1	3	0	R9, R32, R33	603		*
2	4	100	R28, R29, R35, R36	603		*
3	4	511	R3, R21, R40, R37	603		*
4	2	0.01µF	C7, C17	603		*
5	3	0.01µF	C15, C16, C20	603		*
6	2	0.1µF	C13, C14	603		*
7	1	100k	R31	603		*
8	1	10k	R11	603		*
9	1	10k Therm	Th1	603		*
10	1	1k	R34	603		*
11	4	1M	R10, R26, R27, + added	603		*
12	1	1µF	C1	603		*
13	1	1000pF	C10	603		*
14	4	4.7k	R12, R22, R24, R25	603		*
15	2	4.7µF	C21, C22	603		*
16	1	0.01µF	C8	805		*
17	1	**412k**	R1	805		*
18	1	1.8M	R2	805		*
19	1	100k	R13	805		*
20	1	**59k**	R23	805		*
21	1	249k	R39	805		*
22	1	4.7µF	C9	805		*
23	1	46.4k	R38	805		*
24	12	39	R4, R5, R6, R7, R8, R14, R15, R16, R17, R18, R19, R20	2512		Digikey: PT39AFCT-ND
25	1	SW-PB	S1	B3WN-6002		Digikey: SW425CT-ND
26	2	IRFS3207	Q2, Q3	D2PAK		*
27	1	Battery Conn (Female)	J62	HEADER 15X2 3M		Digikey MSD30K-ND
28	1	Battery Conn (Male)	J62	HEADER 15X2 3M		Digikey MHC30K-ND
29	1	BKGD	JP1	HEADER 3X2		*
30	1	HEADER 5	J29	HEADER 5X1		*
31	1	RGO LED	J36	JP_2		Digikey WM6436-ND
32	1	RGO2LED	J68	JP_2		Digikey WM6436-ND
33	4	JMP3	J8, J43, J51, J70	JP_3		Digikey WM6436-ND
34	2	LED	D7, D8	LED_GW		Digikey: P490CT-ND

Bill of Materials (Continued)

ITEM	QTY	PART TYPE	DESIGNATOR	FOOTPRINT	DESCRIPTION	PART FIELD 1
35	1	0.51Ω or 0.005/3W	R30	MISC_SENSE - ALT		Digikey: PT.51YCT-ND (0.51Ω)
36	1	MC9S08QC8	U6	QFN16		Digikey: MC9S08QG8FFE-ND
37	1	ISL9217Z	U4	QFN24		Intersil Provided
38	1	ISL9216Z	U1	QFN32		Intersil Provided
39	1	15V	D9	SOD-123		*
40	1	18V	D6	SOD-123		Digikey: BZT52C18-FDICT-ND
41	1	22V	D11	SOD-123		Digikey: BZT52C22-FDICT-ND
42	13	4.7V	D10, + 12 on input	SOD-123		Digikey: BZT52C4V7-FDICT-ND
43	4	DIODE	D1, D2, D3, D4	SOD-123		Digikey: B0540W-FDICT-ND
44	1	4.7V	D5	SOT23		Digikey: AZ23C3V6-FDICT-ND
45	2	FMMT619	Q1, Q4	SOT23 - NPN		Digikey: FMMT619CT-ND
46	1	ADS1100	U3	SOT23-6		Digikey: 296-14299-1-ND
47	34	6C1	J15	TP	Connector	DigikeyL 5000K-ND
		6C2	J14			
		6C3	J13			
		6C4	J12			
		7C1	J2			
		7C2/6VC	J3			
		7C3	J7			
		7C4	J9			
		7C5	J10			
		7C6	J11			
		7C7	J44			
		7VS/6C5	J1			
		A2DIN	J39			
		AO	J37			
		CFET	J32			
		CSns	J63			
		DFET	J31			
		DSns	J33			
		Pack-	J38			
		RGC	J23			
		RGC2	J66			
		RGO	J25			
		RGO2	J67			
		SCL	J27			

Bill of Materials (Continued)

ITEM	QTY	PART TYPE	DESIGNATOR	FOOTPRINT	DESCRIPTION	PART FIELD 1
		SCLHV	J116			
		SDA	J28			
		SDAIHV	J64			
		SDAOHV	J65			
		TEMP3V	J21			
		TMPI	J22			
		UPRAO	J42			
		VMON	J35			
		WKUP	J26			
		WKUPR	J69			
48	1	CON2	J118	JP_2	Connector	*
49	3	GND	J16, J17, J117	TP SM	Connector	*
DEVICES NOT POPULATED						
		BANANA	B1	BANANA		Not Populated
		BANANA	B3	BANANA		Not Populated
		BANANA	B4	BANANA		Not Populated
		CAPNP	C11	603		Not Populated
		CAPNP	C12	603		Not Populated
		0.01	C2	603		Not Populated
		0.01	C3	603		Not Populated
		0.01	C4	603		Not Populated
		0.01	C5	603		Not Populated
		0.01	C6	603		Not Populated
		CB3	J18	TP	Connector	Not Populated
		CB2	J19	TP	Connector	Not Populated
		CB1	J20	TP	Connector	Not Populated
		BAT+	J24	TP	Connector	Not Populated
		DGate	J30	TP	Connector	Not Populated
		CGate	J34	TP	Connector	Not Populated
		CB4	J4	TP	Connector	Not Populated
		PSCL	J40	TP	Connector	Not Populated
		PSDA	J41	TP	Connector	Not Populated
		CB12	J45	TP	Connector	Not Populated
		CB11	J46	TP	Connector	Not Populated
		CB10	J47	TP	Connector	Not Populated
		CB9	J48	TP	Connector	Not Populated

Bill of Materials (Continued)

ITEM	QTY	PART TYPE	DESIGNATOR	FOOTPRINT	DESCRIPTION	PART FIELD 1
		CB8	J49	TP	Connector	Not Populated
		CB5	J5	TP	Connector	Not Populated
		CB7	J50	TP	Connector	Not Populated
		µCp2	J52	TP	Connector	Not Populated
		µCp1	J53	TP	Connector	Not Populated
		µCp5	J54	TP	Connector	Not Populated
		µCp6	J55	TP	Connector	Not Populated
		µCp8	J56	TP	Connector	Not Populated
		µCp7	J57	TP	Connector	Not Populated
		RxDp12	J58	TP	Connector	Not Populated
		TxDp11	J59	TP	Connector	Not Populated
		CB6	J6	TP	Connector	Not Populated
		HEADER 11	J60	HEADER11		Not Populated
		HEADER 11	J61	HEADER11		Not Populated
		IRF2807	Q12	D2PAK		Not Populated
		IRF2807	Q13	D2PAK		Not Populated
		MOSFET P	Q14	SOT23		Not Populated
		MOSFET P	Q5	SOT23		Not Populated
		MOSFET P	Q6	SOT23		Not Populated
		MOSFET P	Q7	SOT23		Not Populated
		RESIST	R41	603		Not Populated
		RESIST	R42	603		Not Populated
		100k	R43	603		Not Populated
		100k	R44	603		Not Populated
		100k	R45	603		Not Populated
		100k	R46	603		Not Populated
		100k	R47	603		Not Populated
		100k	R48	603		Not Populated
		TPAD	T1	TPAD		Not Populated
		TPAD	T19	TPAD		Not Populated
		TPAD	T2	TPAD		Not Populated
		TPAD	T20	TPAD		Not Populated
		TPAD	T21	TPAD		Not Populated
		TPAD	T3	TPAD		Not Populated
		TPAD	T4	TPAD		Not Populated
		TPAD	T5	TPAD		Not Populated
		TPAD	T6	TPAD		Not Populated

Bill of Materials (Continued)

ITEM	QTY	PART TYPE	DESIGNATOR	FOOTPRINT	DESCRIPTION	PART FIELD 1
		TPAD	T7	TPAD		Not Populated
		TPAD	T8	TPAD		Not Populated
		TPAD	T9	TPAD		Not Populated
		ISL88694	U2	SOT23-5		Not Populated
		CRYSTAL	Y1	32k XTAL	Crystal	Not Populated

Appendix 1

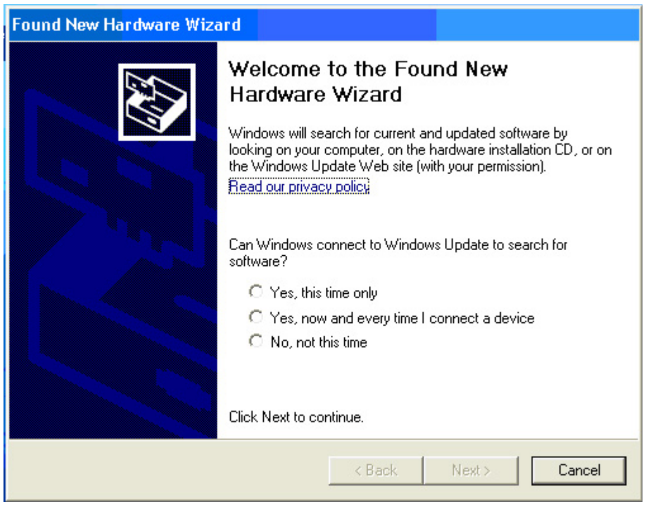
Installing the DeVaSys USB to I^{2}C Board Software

Copy and extract the files from the “PC_software.zip” to the PC at whatever location is desired.

Disconnect the DeVaSys board from the ISL9208, ISL9216 board.

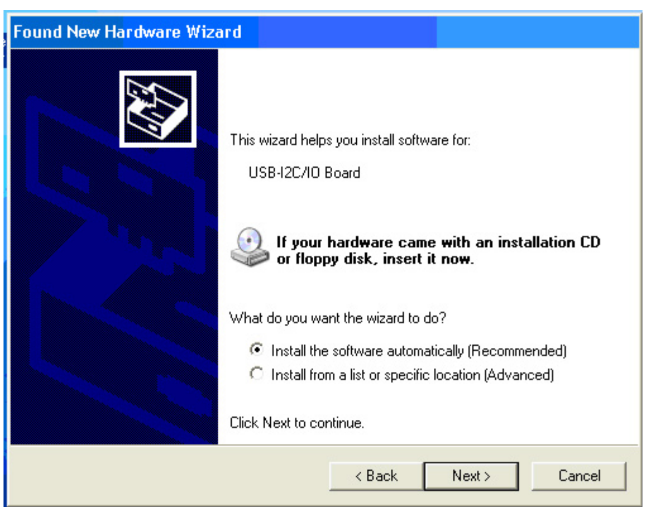
Then, plug in the DeVaSys board into the USB port.

The following screen should pop up.



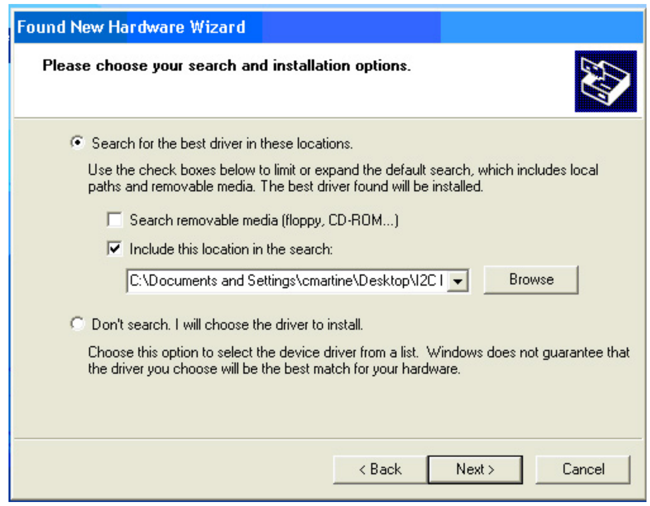
Select “Yes, this time only” and click “Next”.

Then, this screen will come up:



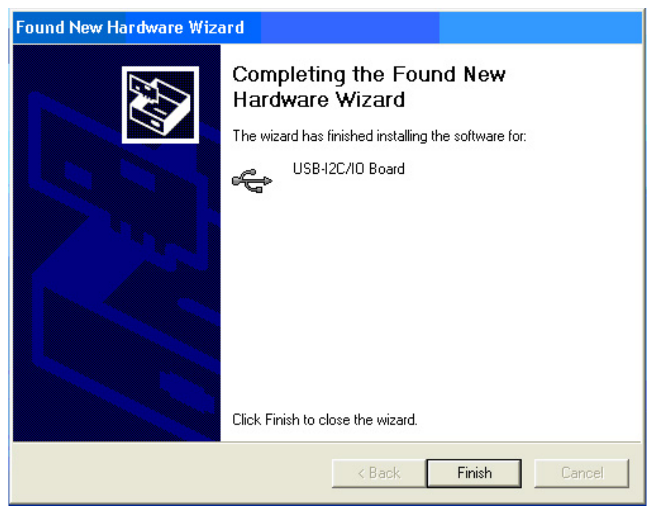
Select “Install from a list or specific location” and click “Next”

A screen like the next one will come up:



Browse for the “Software” directory in the “ISL9208, ISL9216 Eval Kit SW and docs” folder then click “Next”.

This should install the software, eventually bringing up the following screen:



Click “Finish” and you’re done.

Appendix 2

Communication Troubleshooting

IF THE GUI STARTS UP WITH ALL ITEMS "GRAYED OUT"

1. Check that the I^2C cable is connected properly.
2. Check that the board is powered and that the RGO voltages are 3.3V (relative to their device VSS pins).
3. If the RGO voltages are not powered to the right voltage, move to the power supply troubleshooting section.
4. Make sure that the board drivers are installed correctly. When using the DeVaSys USB to I^2C interface board, there should be one red LED and one green LED on lighted.
5. Use a scope to see that the I^2C communication is correct at the board. Monitor the SCL and the SDA lines while initiating a read of the ISL9216 status register. Set the scope to single trigger on the falling edge of SCL.
6. If the I^2C communication is correct at the SCL and SDA pins, check that the communication is correct at the ISL9217. Connect the scope to the SCL terminal and the SCLHV terminal. The SCLHV terminal should follow the SCL voltage, but be shifted to ~3.3V above the ISL9217 VSS terminal (and be slightly delayed). Also check the SDA and SDAOHV test points. SDAOHV should follow SDA, but be shifted in voltage and slightly delayed.
7. Check that the SDA and SCL jumpers (J51 and J43) have shunts on the "PC" side.
8. Check to see that the "I^2C GND" jumper is in place in the "GND" position.
9. Check that the "IC GND" jumper (J118) is in place.

Power Supply Troubleshooting

IF RGO OR RGO2 DO NOT HAVE THE CORRECT VOLTAGE

1. Check that the voltage on each of the input terminals are correct.
2. Check that all cell balance outputs are off.
3. Check that there is no unexpected load on the RGO outputs.

ISL9216, ISL9217 Troubleshooting

IF THE AO VOLTAGES ARE READING INCORRECTLY AT THE AO PIN

1. Make sure that the I^2C jumpers are in the "PC" position.
2. Check that all cell balance outputs are off.
3. Make sure that there is no series resistance between the battery and the input of the ISL9216 and ISL9217 and that the input voltage on each cell is between 2.3V and 4.3V.

IF THE AO VOLTAGES ARE READING INCORRECTLY ON THE GUI

4. Check that the RGO output is 3.33V. GUI and microcontroller calculations assume the RGO voltage is 3.33V. Any variation translates directly into errors in the GUI screen value.
5. Power down the board and stop the GUI. Power up the board and restart the GUI. This should clear any communication problems.
6. If operating with the I^2C Jumpers in the µC position, make sure that the "Partition" setting in the Pack Tab matches the battery connection on the board.

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Refer to "http://www.renesas.com/" for the latest and detailed information.

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