LTC4009-2 Multicell Li-Ion Battery Charger Board

DESCRIPTION

Demonstration circuit 1104B is a single-battery stand-alone charge controller with built-in charge termination featuring the LTC®4009-2. The input voltage is 13.5V to 20V. The charger output voltage is programmed by jumpers to support 1-, 2-, 3- and 4-cell Li-Ion batteries with a cell voltage of 4.2V/cell. The maximum charge current is 2A. The demo board is initially configured for 12.6V Li-Ion batteries. The board will automatically charge a battery as soon as input power is applied with a battery connected prior to power up. Status LEDs are provided for CHG, ACP, C/10, and ICL although this charger is not a smart battery charger, a popular smart battery connector is provided that can be used for data-logging with the optional DC410 demo board and software. To be clear, you do not need a smart battery to use this board. The optional DC410 SMBus-to-Serial port adapter and associated software is to monitor a smart battery for demonstration purposes only. Contact your Analog Devices representative for ordering a DC410.

This demo board is capable of supporting the LTC4009 and LTC4009-1 with a simple IC swap out. See schematic.

Design files for this circuit board are available at http://www.linear.com/demo/DC1104B

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS/NOTES	VALUE
Maximum Input Voltage	Limited by Input Capacitor Volt Ratings	20V ±10 %
Default Battery Charge Voltage	Jumper Selectable: 4.2V, 8.4V, 12.6V and 16.8V	12.6V
Minimum Input Voltage	V_{IN} > V_{BAT} Termination Voltage and DCDIV > 1.2V	13.5V When Using a 12.6V Li-ion Battery Recommend 15V
Shutdown Configuration	V_{IN} > V_{BATMAX} > 6V, Jumper Selectable: OFF, THM and ON	ON
Input Current Limit	Set by Value of R2 at 100mV	2A Using a 0.05Ω Resistor
Maximum Charge Current	V_{IN} > V_{BAT} > 6V and DCDIV > 1.2V	2A ±5%

QUICK START PROCEDURE

1. Connect the input power source to V_{IN} terminals J1 or V_{IN} and GND using a power supply capable of handling 2.5A of current within a 13.5V to 20V range. The input supply voltage must be greater than the full voltage value of the battery to allow a full charge to take place.
2. Connect the load to V_{OUT} and GND terminals.
3. Configure the jumpers for your specific battery.
4. Plug in the battery. Industry-standard 5-pin AMP smart battery connector is provided as well as generic soldering test points for hard-wire connections.
5. Turn on the input power supply.
6. Optionally use the provided DC410 demonstration software to configure and communicate with the DC1104B.

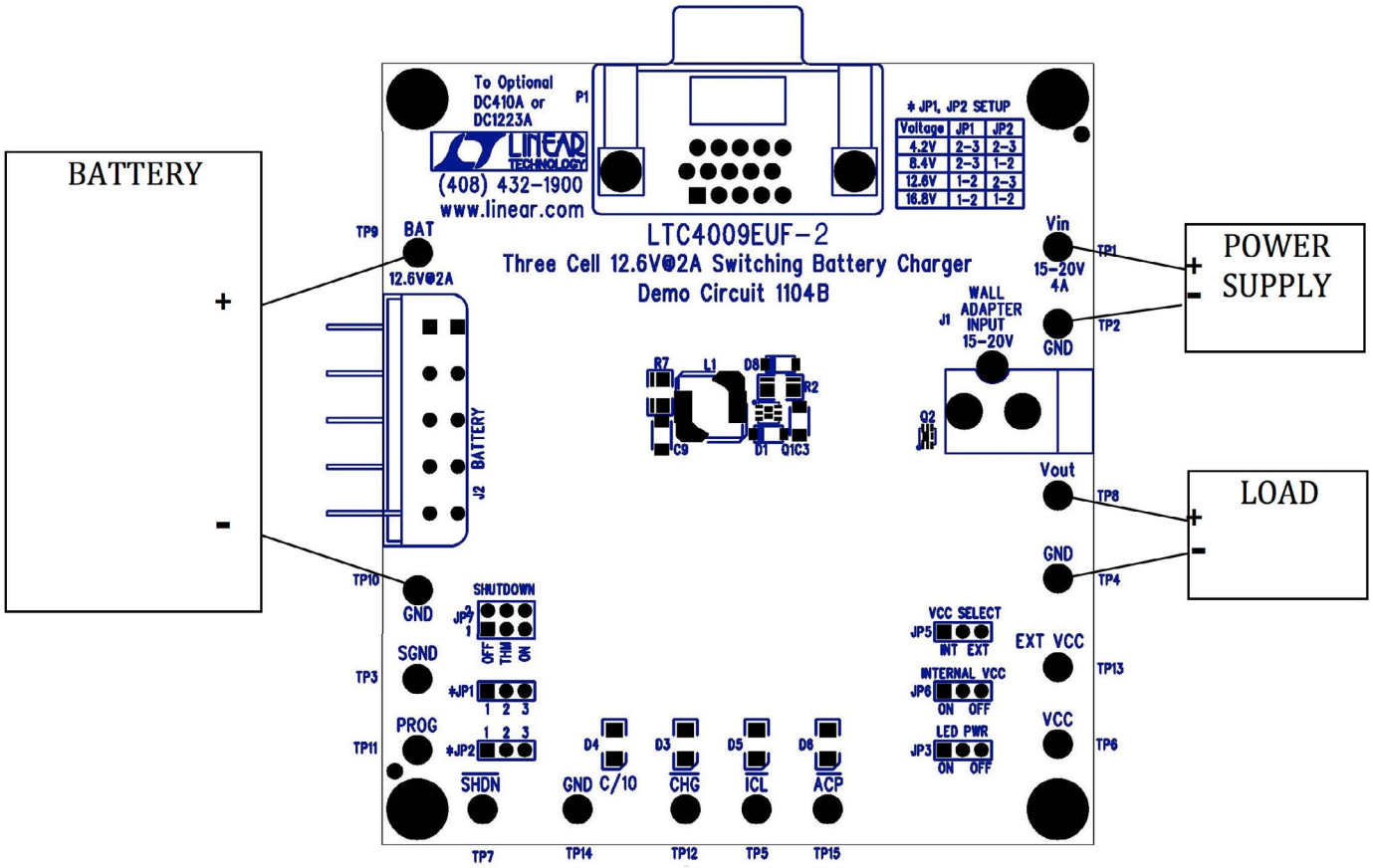


Figure 1. Optional DC410 SMBUS to Serial Adapter, Provides Data Logging and Control Battery

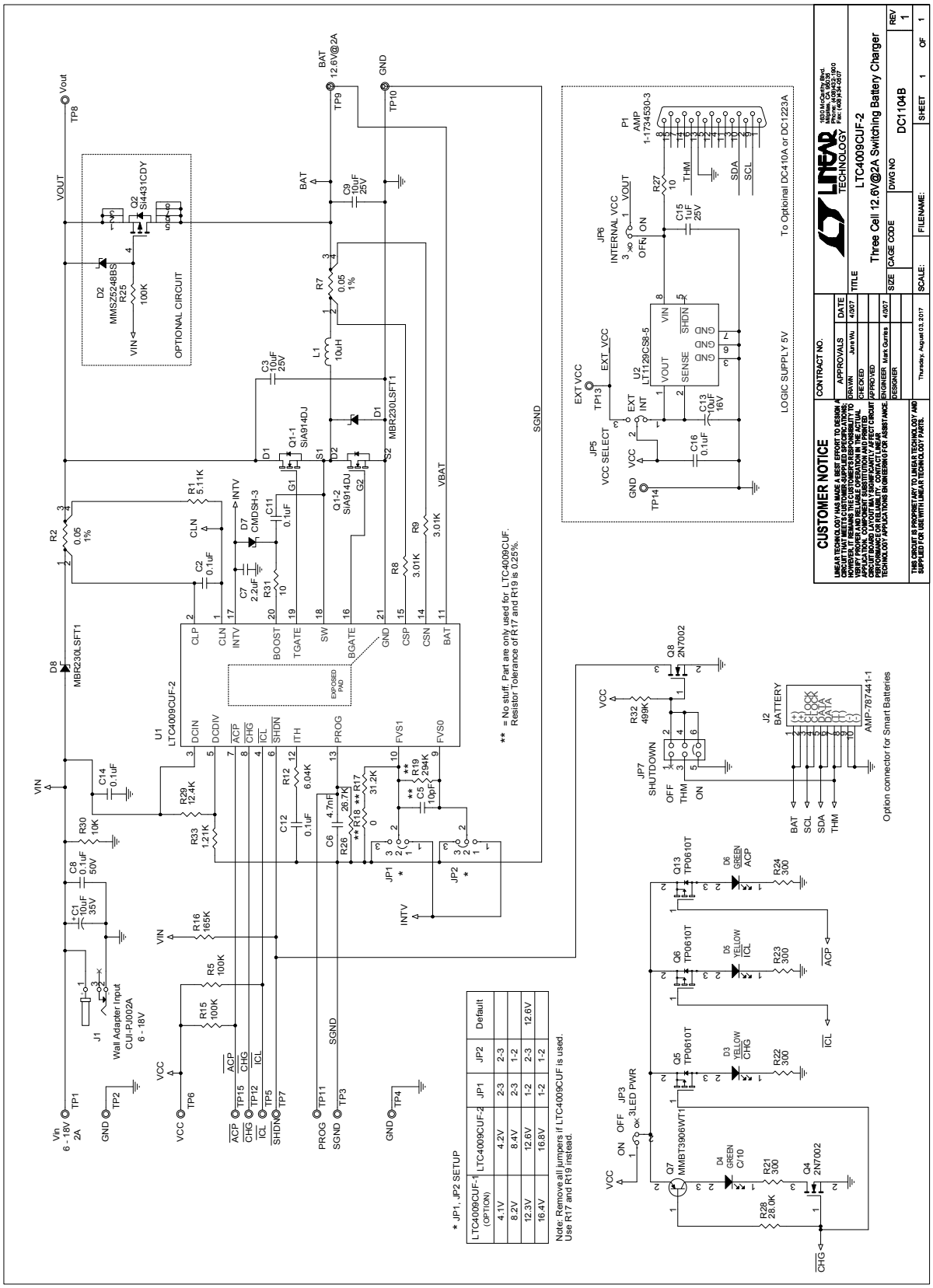
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, ALUM 10µF, 35V, 5X6.0 SIZE	SUNCON, 35CE10AX
2	5	C2, C8, C11, C14, C16	CAP, X7R, 0.1µF, 50V, 10% 0603	TDK, C1608X7R1H104K
3	1	C12	CAP, X7R, 0.1µF, 16V, 10% 0402	TDK, C1005X7R1C104K
4	2	C3, C9	CAP, X5R, 10µF, 25V, 20% 1206	TAIYO YUDEN, TMK316BJ106ML
5	1	C6	CAP, X7R, 4.7nF, 50V, 10% 0402	TDK, C1005X7R1H472K
6	1	C7	CAP, X5R, 2.2µF, 16V, 20% 0805	TDK, C2012X5R1C225M
7	1	C13	CAP, TANT 10µF 16V 20% 3828	AVX TAJB106M016
8	1	C15	CAP, X7R 1µF 25V 10% 1206	AVX 12063C105KAT
9	2	D1, D8	SCHOTTKY RECT, MBR230LSFT1 SOD-123FL	ON SEMI, MBR230LSFT1G
10	2	D3, D5	LED, AMBER	ROHM SEMI, SML-010DTT86M
11	2	D4, D6	LED, GREEN	ROHM SEMI, SML-010FTT86L
12	1	D7	DIODE, CMDSH-3, SOD-323	CENTRAL SEMI, CMDSH-3TR (PBF)
13	1	L1	INDUCTOR, 10µH, CDR7D28MN SERIES	SUMIDA, CDR7D28MNNP-100 NC
14	1	Q1	DUAL-N-CH FET, SiA914ADJ, POWERPAK SC-70-6	VISHAY, SIA914ADJ-T1-GE3
15	1	R1	RES, CHIP, 5.11k, 1/16W, 1% 0603	VISHAY, CRCW06035K11FKEA
16	2	R2, R7	SENSE RES, LRC, 0.05, 0.25W, 1% 1206	WISHAY, WSL1206R0500FEA
17	2	R5, R15	RES, CHIP, 100k, 1/16W, 5% 0402 e3	VISHAY, CRCW0402100KJNED
18	2	R8, R9	RES, CHIP, 3.01k, 1/16W, 1% 0402	VISHAY, CRCW04023K01FKED
19	1	R12	RES, CHIP, 6.04k, 1/16W, 1% 0402	VISHAY, CRCW04026K04FKED
20	1	R16	RES, CHIP, 165k, 1/16W, 1% 0402 e3	VISHAY, CRCW0402165KFKED
21	1	R26	RES, CHIP, 26.7k, 1/16W, 1% 0402	VISHAY, CRCW040226K7FKED
22	2	R27, R31	RES, CHIP, 10, 1/16W, 5% 0603	VISHAY, CRCW060310R0JNEA
23	1	R29	RES, CHIP, 12.4k, 1/16W, 1% 0402	VISHAY, CRCW040212K4FKED
24	1	R30	RES, CHIP, 10k, 1/16W, 5% 0603 e3	VISHAY, CRCW060310K0JNEA
25	1	R33	RES, CHIP, 1.21k, 1/16W, 1% 0402 e3	VISHAY, CRCW04021K21FKED
26	1	U1	IC LTC4009CUF-2, QFN-20(4X4)	LINEAR TECH, LTC4009CUF-2#PBF
27	1	U2	IC LT1129CS8-5 SOS	LINEAR TECH, LT1129CS8-5#PBF
Additional Demo Board Circuit Components				
1	1	D2	DIODE, MMSZ5248BS, SOD-323	DIODES INC, MMSZ5248BS-7-F
2	1	Q2	P-CH, 60V, Si4431CDY-T1-GE3, SO8	VISHAY, Si4431CDY-T1-GE3
3	1	R25	RES, CHIP, 100k, 1/16W, 5% 0402 e3	VISHAY, CRCW0402100KJNED
4	0	(U1 OPTION)	IC LTC4009CUF-1, QFN-20(4X4)	LINEAR TECH, LTC4009CUF-1#PBF
5	0	(U1 OPTION)	IC LTC4009CUF, QFN-20(4x4)	LINEAR TECH, LTC4009CUF#PBF
6	0	R17 (FOR 4009CUF ONLY)	RES, CHIP, 31.2k, 1/16W, 025% 0402 e3	
7	0	R18 (FOR 4009CUF ONLY)	RES, CHIP, 0, 0402 e3	
8	0	R19 (FOR 4009CUF ONLY)	RES, CHIP, 294k, 1/16W, 0.25% 0402 e3	
9	0	L1 (OPTION)	INDUCTOR, 10µH, IHLP-2525CZ-01 SERIES	VISHAY, IHLP2525CZER100M01
10	0	C5 (FOR U1 = 4009CUF ONLY)	CAP, C0G, 10pF, 50V, ±0.5pF 0402	

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Hardware: For Demo Board Only				
1	15	TP1 TO TP15	TESTPOINT, TURRET, 0.061"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	1	J1	CONNECTOR	CUI-STACK, CUI-PJ002A(PBF)
3	1	J2	HDR ASY, RA, NO KEY, STR TAIL	TYCO ELC, 5787441
4	5	JP1 TO JP3, JP5, JP6	HEADER 3 PIN 0.079 SINGLE ROW	SAMTEC, TMM103-02-L-S
5	6	JP1 TO JP3, JP5 TO JP7	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G
6	1	JP7	2X3, 0.079 DOUBLE ROW HEADER	SAMTEC, TMM103-02-L-D
7	3	Q6, Q5, Q13	P-CHAN, TP0610T SOT-23	VISHAY, TP0610K-T1-E3
8	1	Q7	TRANSISTOR, MMBT3906WT1 SOT-323	ON SEMI, MMBT3906WT1G
9	2	Q4, Q8	N-CH MOSFET, 2N7002	ZETEX, 2N7002 (PBF)
10	1	R32	RES, CHIP, 499k, 1/16W, 1% 0603 e3	VISHAY, CRCW0603499KFKEA
11	1	R28	RES, CHIP, 28k, 1/16W, 1% 0603	VISHAY, CRCW060328K0FKEA
12	4	R21, R22, R23, R24	RES, CHIP, 300, 1/16W, 5% 0603	VISHAY, CRCW0603300RJNEA
13	1	P1	CONNECTOR, DSUB, 15 PIN	AMP INC 1-1470250-3
14	4	STAND-OFF	STAND-OFF, NYLON 0.25"	KEYSTONE, 8831(SNAP ON)
15	1		FAB, PRINTED CIRCUIT BOARDS	DEMO CIRCUIT #1104B
16	2		STENCIL	STENCIL 1104B

SCHEMATIC DIAGRAM



ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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