DESCRIPTION

Demonstration circuit 532 is a flexible one or two cell Li-ion battery charger and DC/DC converter. Power is input to the circuit via an adapter input. This power is used to both charge a battery and provide a regulated DC output of 3.3V. In the event that the input power is removed, the battery supports operation of the 3.3V output. The demo card supports via jumper selection either 4.1V or 4.2V cell chemistries and either one or two cell systems. It is one of the few circuits that can charge an 8.2V battery from a 5V adapter.

Design files for this circuit board are available. Call the LTC factory.

Table 1. Performance Summary

PARAMETER	CONDITION	VALUE
Input Voltage		3.5-6.5V
I_{OUT}	V_{IN} =5V, V_{BAT}=7.2V	1000mA +- 7%
Float Voltage	V_{IN} =5V	+-1%
Trickle Charge Threshold	V_{IN} = 5V	2.7Vper cell
C/10 detection	V_{IN} =5V V_{BAT}=4.2	75mA-150mA
Recharge Threshold	V_{IN} 5V	V_{FLOAT} –200mV
Linear Regulator Output voltage	V_{IN} = 5V I_{OUT}= 400mA	3.3V +-2%

OPERATING PRINCIPLES

DC532 is a switch mode constant current, constant voltage timer terminated battery charger. Figure 1 shows a block diagram of the basic circuit. Input voltages of from 3.5 to 6.5V are converted into a charge current of up to 1000mA into an 8.4V battery using a synchronous flyback converter. A 3.3V output is provided via a linear regulator from the adapter input. When the adapter is removed, the converter operates “backwards” discharging the battery by exploiting the bi-directional properties of synchronous converters in order to provide power to the linear regulator. Jumpers are provided to allow the user to easily configure the demo card to their system requirements.

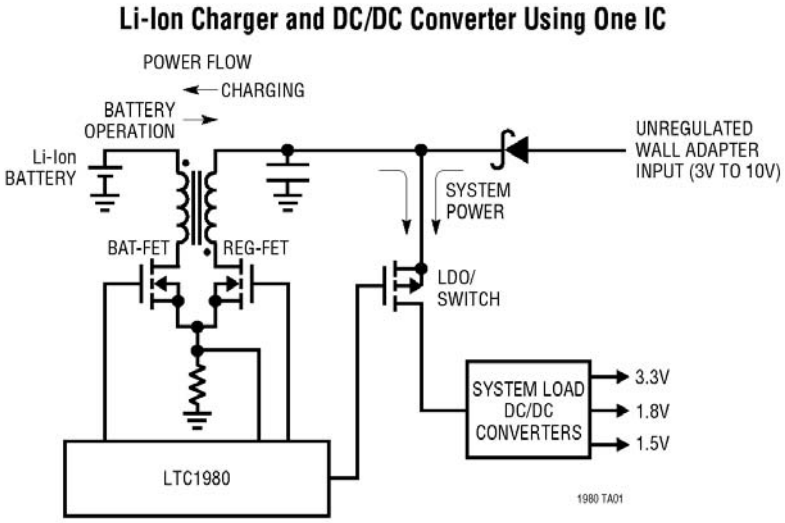


Figure 1. System Block Diagram

QUICK START PROCEDURE

Demonstration circuit DC532 is easy to set up to evaluate the performance of the LTC1980. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

1. Connect input power supply, meters and output load as shown in figure 2.
2. Verify that the cell voltage selection jumper (JP1) and the cell number selection jumper (JP2) are in the correct position for the battery you wish to charge.
3. Set the battery simulator voltage to zero, slowly raise the input voltage. When the supply voltage exceeds 3.5V the charger should activate. At this point trickle charging of the battery should commence and the output voltage of the linear regulator should be in regulation

   NOTE: Make sure that the input voltage does not exceed 6.5V.
4. Note that so long as the battery voltage is under the Trickle Charge threshold of 2.5V per cell the charge current is 10% of the selected charge current or approximately 100mA.
5. Increase the battery voltage to about 3V per cell and note that the charge current has increased beyond the trickle charge current to the programmed charge current of 1000mA
6. Continue to increase the battery voltage, as the battery voltage approaches the jumper selected float voltage of the charge current will begin to drop.
7. Remove the input adapter power, and note that the charge current is now negative indicating that the battery is being discharged. Further note that the 3.3V output is still present.
8. Place the enable jumper in the OFF position. Note that the battery current draw is extremely low (approx 10uA) also note that the supply current draw is low (approx 20uA)

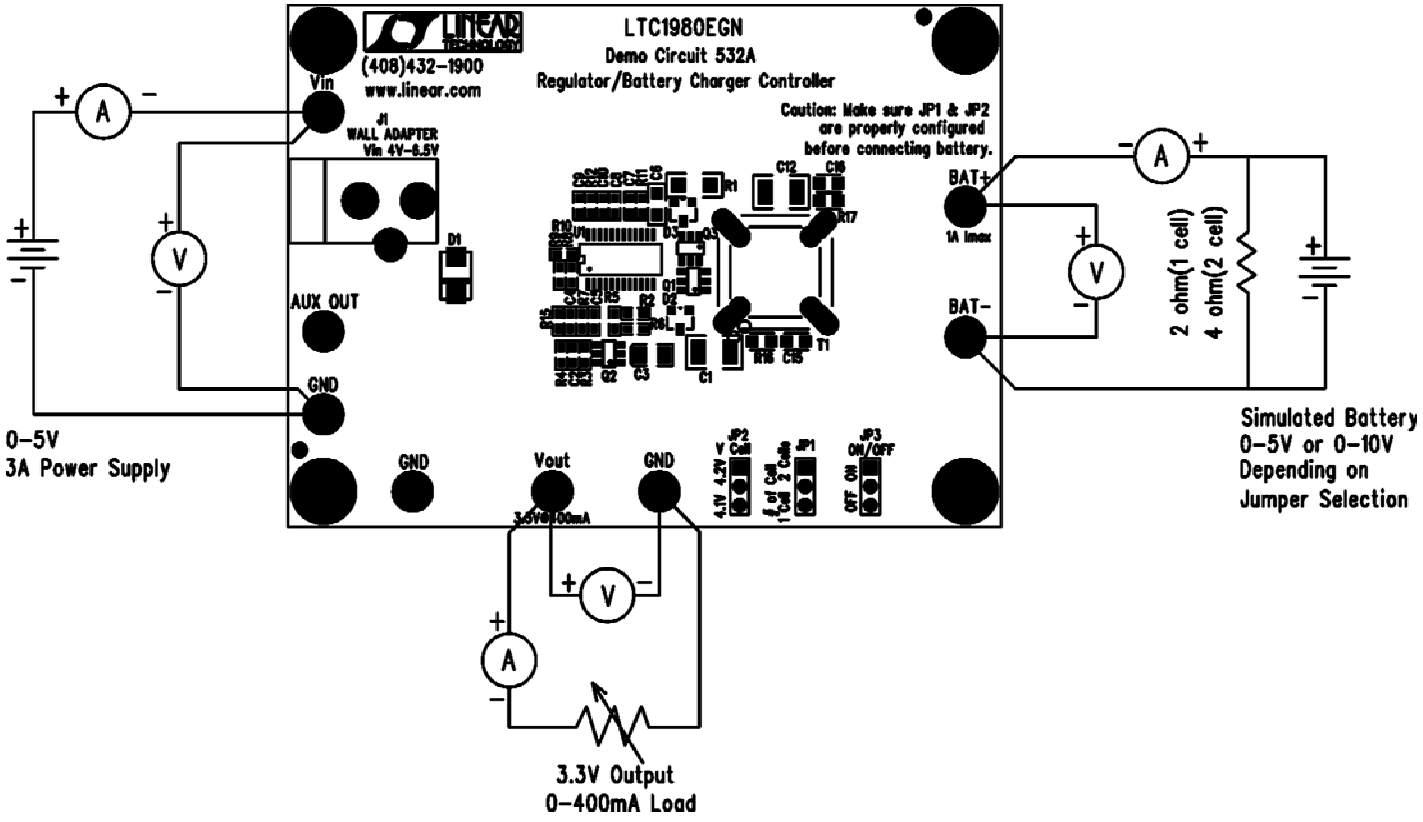


Figure 2. Proper Measurement Equipment Setup

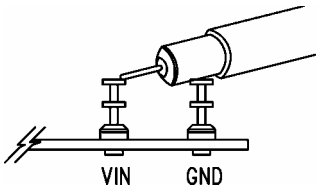
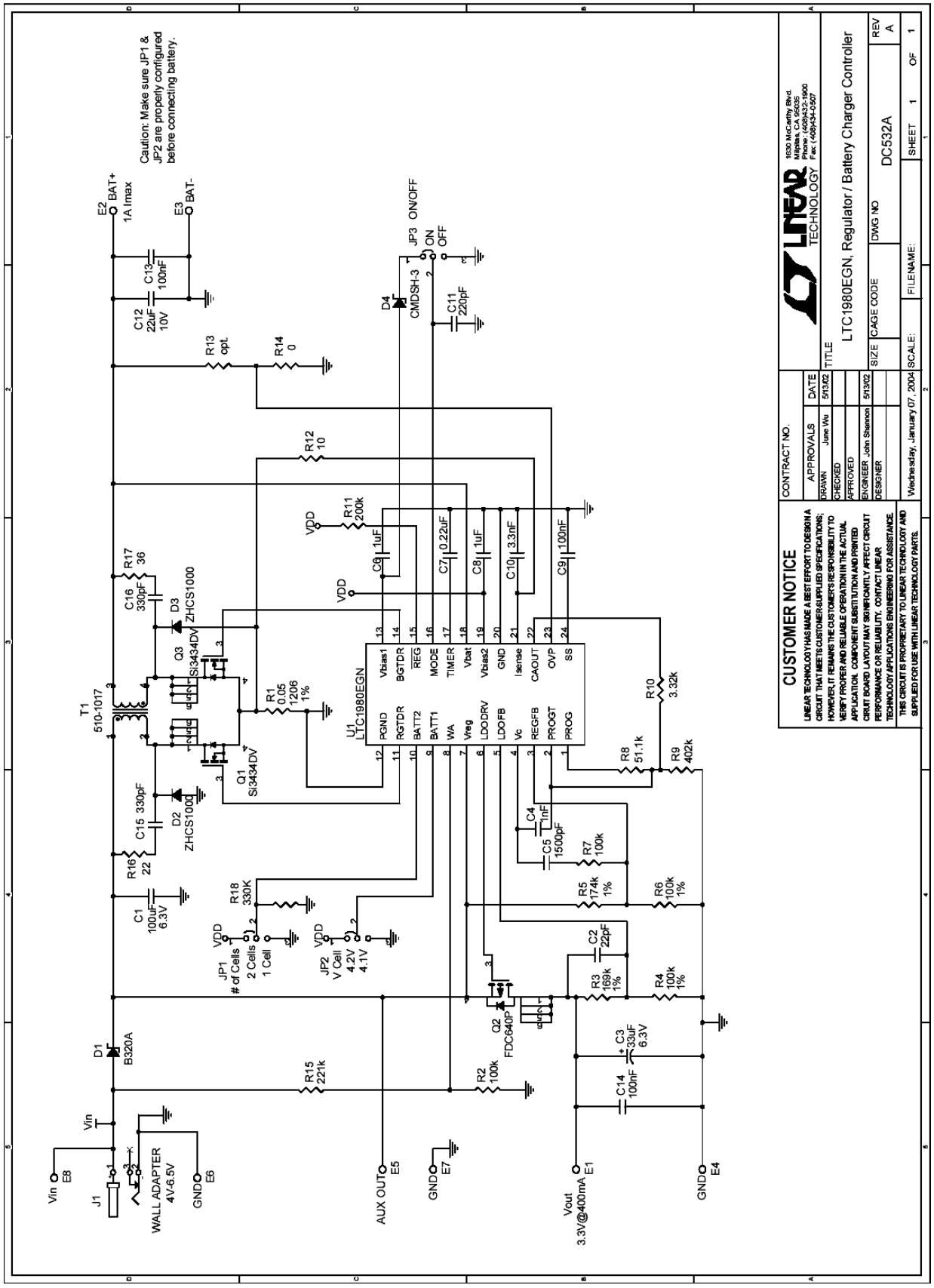


Figure 3. Measuring Input or Output Ripple


Caution: Make sure JP1 & JP2 are properly configured before connecting battery.
E2 BAT+ 1A Imax
E3 BAT-
JP3 ON/OFF
ON
OFF
D4 CMDSH-3
C11 220pF
C12 22uF 10V
C13 100nF
R13 opt
R14 0
R12 10
R11 200k
VDD
C6 1uF
C7 0.22uF
C8 1uF
C10 3.3nF
C9 100nF
T1 510-1017
R17 36
C16 330pF
D3 ZHCS1000
Q3 Si3434DV
Q1 Si3434DV
R1 0.05 1206 1%
U1 LTC1980EGN
PGND RGTDR BATT2 BATT1 WA Vreg LDODRV LDOFB Vc REGFB PROGT PROG
Vbias1 BGTDR REG MODE TIMER Vbat Vbias2 GND Isense CAOUT OVP SS
R10 3.32k
R8 51.1k
R9 402k
C4 1nF
C5 1500pF
R7 100k
R5 174k 1%
R6 100k 1%
C15 330pF
D2 ZHCS1000
R16 22
C1 100uF 6.3V
R18 330K
JP1 # of Cells 2 Cells 1 Cell
JP2 V Cell 4.2V 4.1V
C2 22pF
R3 169k 1%
R4 100k 1%
Q2 FDC640P
D1 B320A
R15 221k
R2 100k
C3 33uF 6.3V
C14 100nF
J1
WALL ADAPTER 4V-6.5V
Vin E8
GND E6
AUX OUT E5
GND E7
Vout 3.3V@400mA E1
GND E4
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THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
DRAWN Jane Wu
CHECKED
APPROVED
ENGINEER John Shannon
DESIGNER
DATE 5/13/02
SIZE 5/13/02
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Wednesday, January 07, 2004
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TITLE
LTC1980EGN, Regulator / Battery Charger Controller
DWG NO
DC532A
FILENAME:
REV A
SHEET 1 OF 1