QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 862
MICROPWER REGULATED CHARGE PUMP DC/DC CONVERTER
LTC3221-3.3, LTC3221-5 and LTC3221

DESCRIPTION

Demonstration circuit 862 is a micropower regulated charge pump DC/DC converter with the LTC3221 in a 2mmx2mm DFN package. It comes in three assembly versions, DC862A-A, DC862A-B and DC862A-C, featuring LTC3221EDC-3.3, LTC3221EDC-5, and LTC3221EDC, respectively. The DC862A-A generates a fixed 3.3V output. The DC862A-B generates a fixed 5V output. The DC862A-C generates a programmable regulated 3V output. The maximum output current is **60mA**.

The LTC3221 draws ultra low quiescent current at no load to extend battery life. The quiescent current is even lower than the self-discharging current of many batteries. By adopting a constant current to charge the output, the output ripple is low even at high input and light load and is rather constant over the full input voltage range. This minimizes output capacitor size and reduces solution cost and space. Built-in soft-start prevents excessive inrush current at turn-on and short-circuit current limit/thermal protection helps the part survive continuous short-circuit. All these features make the circuit ideal for the low power and space-constrained applications in battery powered portable systems.

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

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION		MINIMUM	TYPICAL	MAXIMUM
Input Voltage Range	DC862A-A		1.8V		4.4V
	DC862A-B		2.7V		5.5V
	DC862A-C		1.8V		3.8V
Maximum Output Current	DC862A-A: V_{IN} > 2V; DC862A-B: V_{IN} > 3V; DC862A-C: V_{IN} > 1.8V			60mA	
Output Voltage V_{OUT}	DC862A-A	V_{IN} > 2V, I_{OUT} < 60mA 1.8V < V_{IN} < 2V, I_{OUT} < 25mA	3.168	3.3	3.432
	DC862A-B	V_{IN} > 3V, I_{OUT} < 60mA 2.7V < V_{IN} < 3V, I_{OUT} < 25mA	4.8	5	5.2
	DC862A-C	V_{IN} > 1.8V, I_{OUT} < 60mA	2.88	3	3.12
Output Ripple V_{OUT}	I_{OUT} = 0mA (20MHz BW)	DC862A-A V_{IN} = 4.4V			40mV$_{P-P}$
		DC862A-B V_{IN} = 5.5V			90mV$_{P-P}$
	I_{OUT} = 60mA	DC862A-C V_{IN} = 3.8V			57mV$_{P-P}$
Nominal Switching Frequency				600kHz	
Efficiency	DC862A-A	V_{IN} = 2V, I_{OUT} = 60mA		82%	
	DC862A-B	V_{IN} = 2.7V, I_{OUT} = 60mA		86%	
	DC862A-C	V_{IN} = 1.8V, I_{OUT} = 60mA		82.8%	

QUICK START PROCEDURE

Demonstration circuit 862 is easy to set up to evaluate the performance of the LTC3221EDC-3.3, LTC3221EDC-5, and LTC3221EDC. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE: *When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the Vin or Vout and GND terminals. See Figure 2 for proper scope probe technique.*

1. Place jumper JP1 to the ON position.
2. With power off, connect a 1.8V-5.5V power supply to Vin and GND. The supply should be capable of providing 200mA current.
3. Connect a load to Vout and GND.
4. Turn on the power at the input.

   NOTE: Make sure that the input voltage does not exceed the corresponding maximum voltage (e.g. 4.4V for DC862A-A, 5.5V for DC862A-B, 3.8V for DC862A-C).
5. Check for the proper output voltages. For DC863A-A, Vout should be within 3.168V to 3.432V. For DC862A-B, Vout should be within 4.8V to 5.2V. For DC862A-C, Vout is should be within 2.88V to 3.12V.

   NOTE: *If there is no output, temporarily disconnect the load to make sure that the load is not set too high.*
6. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

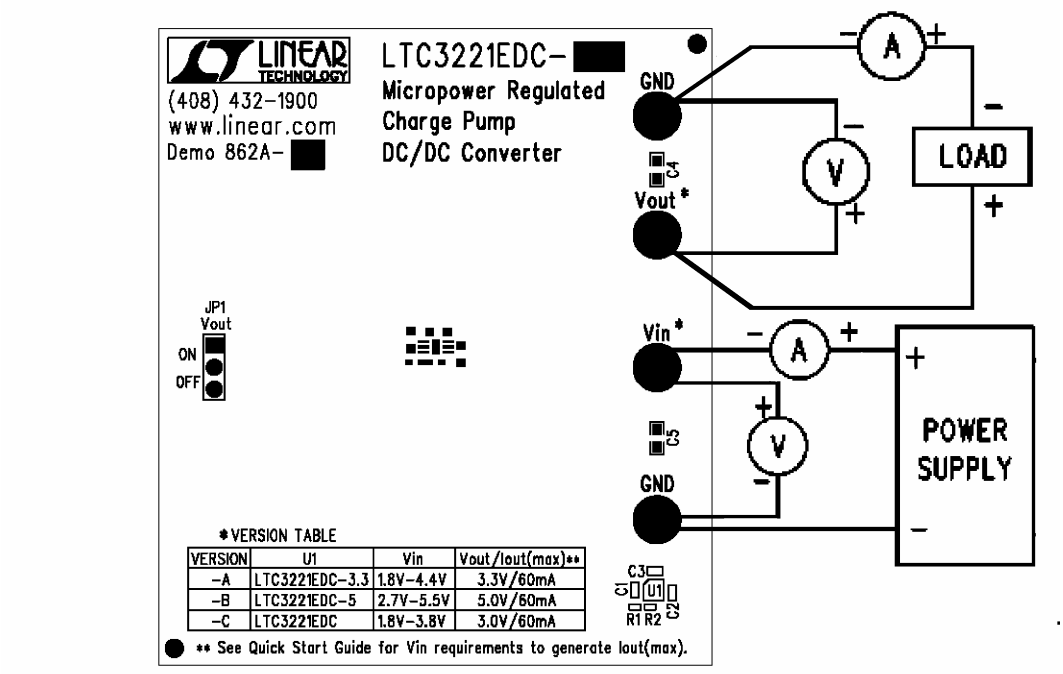


Figure 1. Proper Measurement Equipment Setup

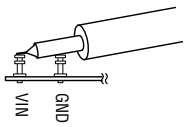
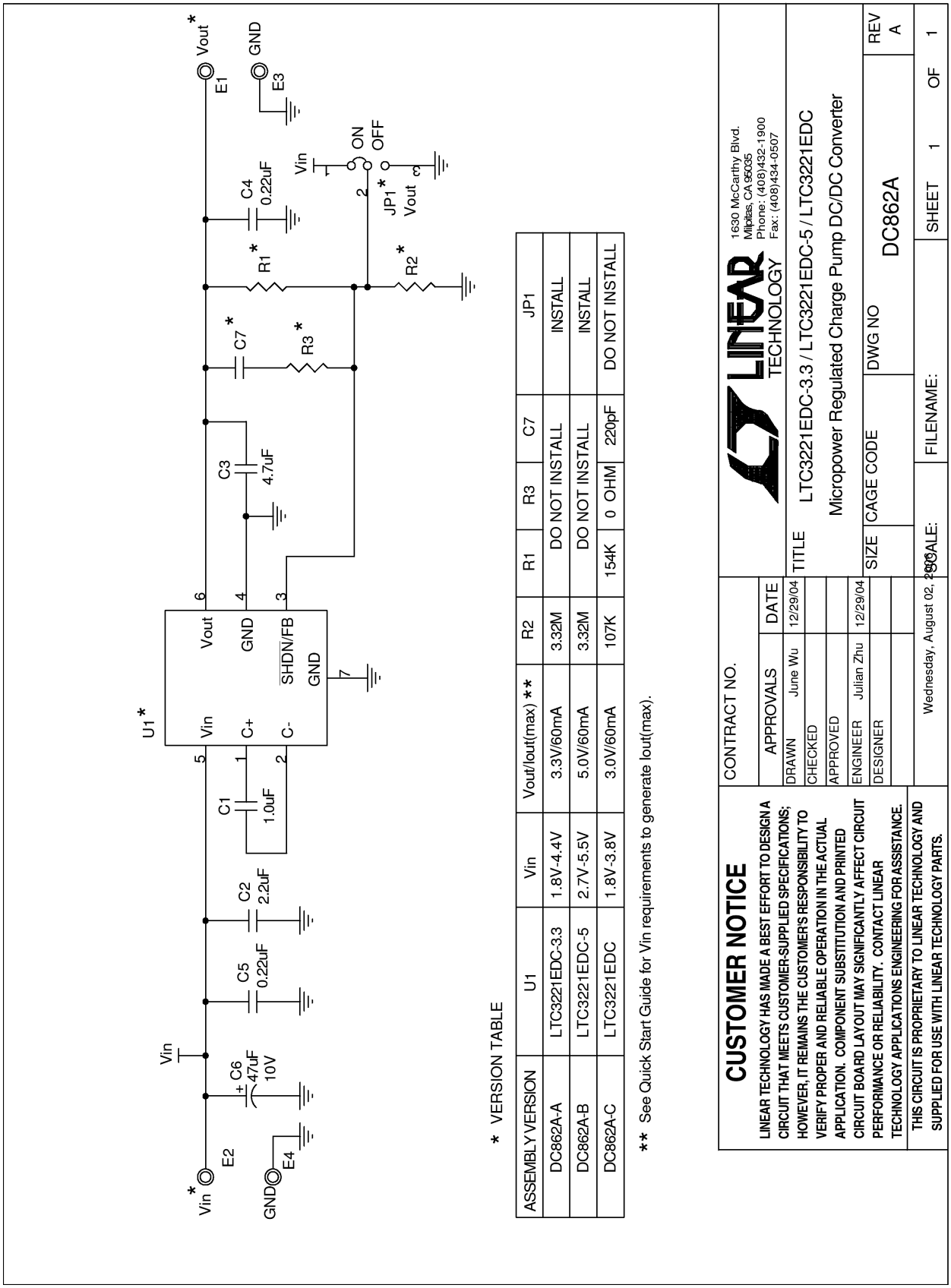


Figure 2. Measuring Input or Output Ripple

OPERATION PRINCIPLES

The LTC3221 family regulator uses a switched capacitor charge pump to boost Vin to a regulated output voltage. Regulation is achieved by monitoring the output voltage, Vout, using a comparator and keeping it within a hysteresis window. If Vout drops below the lower trip point, Vout is charged by the controlled current in series with the flying capacitor. Once Vout goes above the upper trip point, the flying capacitor is disconnected from Vout. Vout is discharged and the flying capacitor is then replenished by the controlled current for a certain time. Once the lower threshold is reached, Vout is charged by the controlled current again.

Burst Mode operation, soft-start and short-circuit /thermal protection can be found on the LTC3221 datasheet at www.linear.com.



* VERSION TABLE

ASSEMBLY VERSION	U1	Vin	Vout/Iout(max) **	R2	R1	R3	C7	JP1
DC862A-A	LTC3221EDC-3.3	1.8V-4.4V	3.3V/60mA	3.32M	DO NOT INSTALL			INSTALL
DC862A-B	LTC3221EDC-5	2.7V-5.5V	5.0V/60mA	3.32M	DO NOT INSTALL			INSTALL
DC862A-C	LTC3221EDC	1.8V-3.8V	3.0V/60mA	107K	154K	0 OHM	220pF	DO NOT INSTALL

** See Quick Start Guide for Vin requirements to generate Iout(max).

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THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

CONTRACT NO.

APPROVALS		DATE
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CHECKED		
APPROVED		
ENGINEER	Julian Zhu	12/29/04
DESIGNER		

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TITLE: LTC3221EDC-3.3 / LTC3221EDC-5 / LTC3221EDC
Micropower Regulated Charge Pump DC/DC Converter

SIZE	CAGE CODE	DWG NO	REV
		DC862A	A

Wednesday, August 02, 2006 SCALE:

FILENAME:

SHEET 1 OF 1