QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 761
LOW NOISE REGULATED CHARGE PUMP IN 2X2 DFN
LTC3204-5 and LTC3204-3.3

DESCRIPTION

Demonstration circuit 761 is a low noise regulated charge pump in 2X2 DFN. There are two assembly versions, DC761A-A and DC761A-B for featuring the LTC3204-5 and LTC3204-3.3 respectively. The DC761A-A produces a regulated 5V output from a 2.7V to 5.5V input. The guaranteed output load current is **150mA** for V_{IN} between 3.1V and 5.5V, and 65mA for V_{IN} less than 3.1V. The DC761A-B produces a regulated 3.3V output from a 1.8V to 4.5V input. The guaranteed output current is 50mA from V_{IN} between 1.9V and 4.5V, and 40mA for V_{IN} less than 1.9V. The circuit requires only three tiny 0603 surface mount capacitors and consumes minimal board space. No inductor and diode are needed. The circuit features automatic Burst Mode® operation at light loads to maintain low supply current. Built-in soft-start circuitry prevents excessive inrush current during start-up. Thermal shutdown and current-limit circuitry allow the parts to survive a continuous output short circuit. These circuits are particularly useful in systems that require extremely low quiescent current, such as battery-powered systems.

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

PERFORMANCE SUMMARY

PARAMETER	CONDITION	MIN	TYP	MAX
Input Voltage Range	DC761A-A (for LTC3204-5)	2.7V		5.5V
	DC761A-A (for LTC3204-3.3)	1.8V		4.5V
Output Voltage V_{OUT}	DC761A-A (for LTC3204-5) 3.1V< V_{IN} <5.5V, I_{OUT}<150mA 2.7V< V_{IN} <5.5V, I_{OUT}<65mA	4.8V	5V	5.2V
	DC761A-B (for LTC3204-3.3) 1.9V< V_{IN} <4.5V, I_{OUT}<50mA 1.8V< V_{IN} <4.5V, I_{OUT}<40mA	3.168V	3.3V	3.432V
Output Ripple V_{OUT}	V_{IN} = 3.6V, I_{OUT} = 150mA (DC761A-A)		$20mV_{P-P}$	$50mV_{P-P}$
	V_{IN} = 2.4V, I_{OUT} = 50mA (DC761A-B)		$10mV_{P-P}$	$20mV_{P-P}$
Nominal Switching Frequency			1.2MHz	
Efficiency	V_{IN} = 3.0V, I_{OUT} = 150mA (DC761A-A)		81.3%	
	V_{IN} = 1.8V, I_{OUT} = 25mA (DC761A-B)		88.7%	

QUICK START PROCEDURE

Demonstration circuit 761 is easy to set up to evaluate the performance of the LTC3204-5 and LTC3204-3.3. 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 V_{IN} or V_{OUT} and GND terminals. See Figure 2 for proper scope probe technique.*

1. Place jumpers in the following positions:

   JP1 ON

2. With power off, connect the input power supply to V_{IN} and GND terminals.
3. Connect the load between V_{OUT} and GND terminals.
4. Turn on the power at the input.

   NOTE: *Make sure that the input voltage does not exceed 5.5V for DC761A-A or 4.5V for DC761A-B. To prevent input voltage overshoot when the circuit is connected to a live supply, an aluminum electrolytic capacitor can be added to bypass the V_{IN} at the input terminals. See Linear Technology Application Note 88 for a complete discussion.*

5. Check for the proper output voltages. V_{OUT} = 4.8V to 5.2V for DC761A-A, V_{OUT} = 3.168V to 3.432V for DC761A-B

   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.

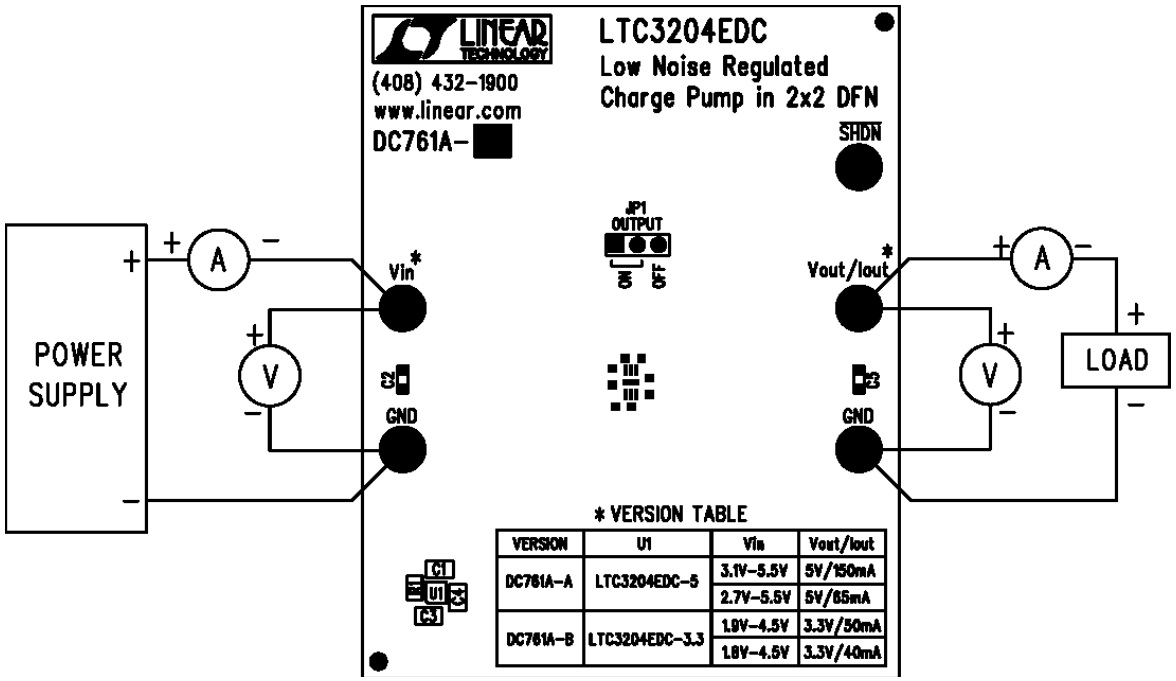


Figure 1. Proper Measurement Equipment Setup

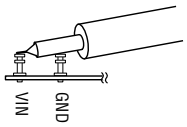
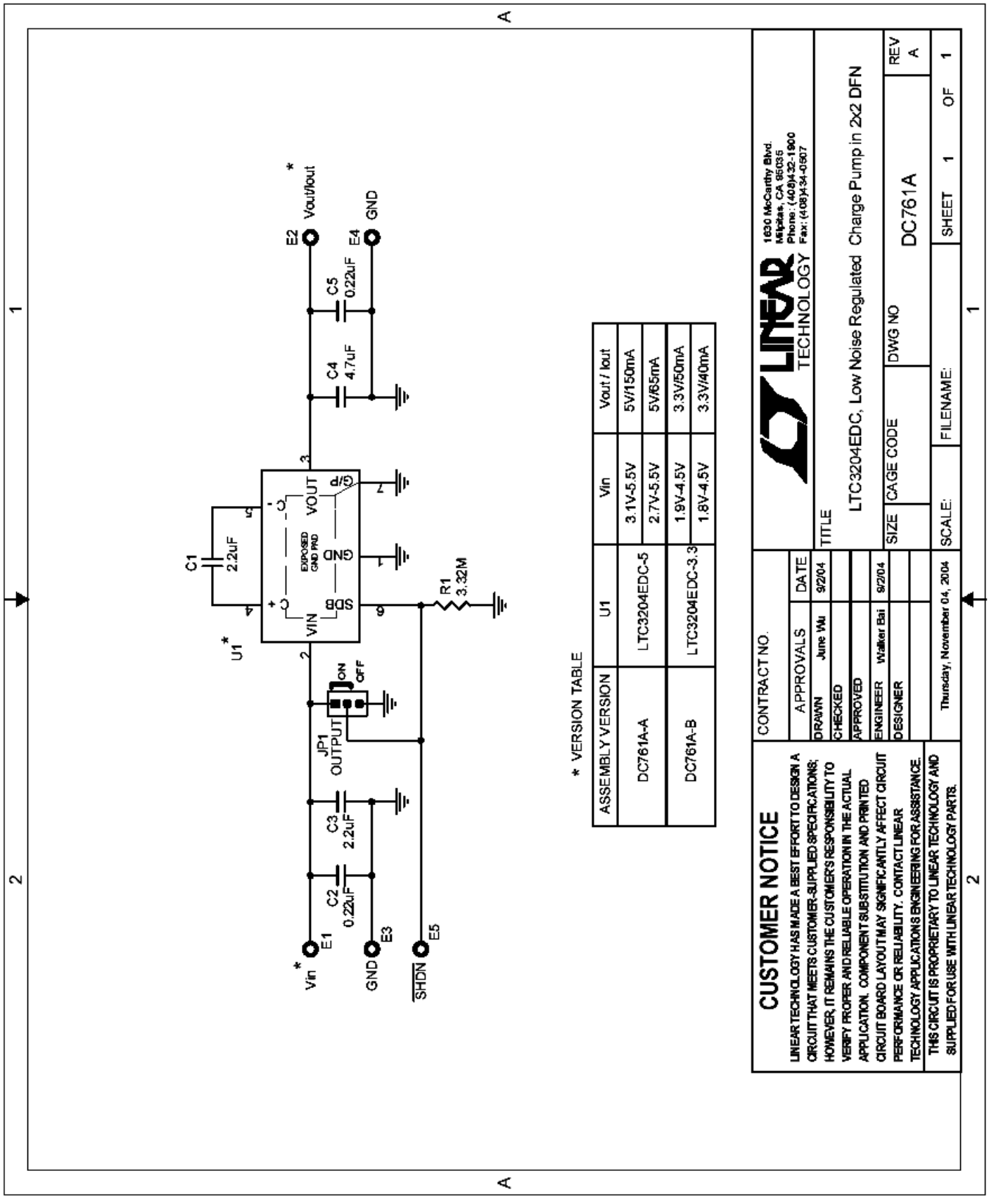


Figure 2. Measuring Input or Output Ripple

OPERATING PRINCIPLES

The LTC3204-5/LTC3204-3.3 use a switched capacitor charge pump to boost V_{IN} to a regulated voltage. Regulation is achieved by sensing the output voltage through an internal resistor divider and modulating the charge pump output current based on the error signal. A 2-phase non-overlapping clock activates the charge pump switches. The flying capacitor is charged from V_{IN} on the first phase of the clock. On the second phase of the clock, it is stacked in series with V_{IN} and connected to V_{OUT}. This sequence of charging and discharging the flying capacitor continues at a free running frequency of 1.2MHz.

Other operation principles, such as Burst Mode® and Soft-Start, can be found on the LTC3204-5/LTC3204-3.3 datasheet at www.linear.com.


C1
2.2uF
U1*
VIN
SHDN
GND
VOUT
EXPOSED GND PAD
C2
0.22uF
C3
2.2uF
JP1
OUTPUT
ON
OFF
R1
3.32M
C4
4.7uF
C5
0.22uF
E1
E2
E3
E4
E5
Vin*
Vout/Iout*
GND
GND
SHDN
* VERSION TABLE
ASSEMBLY VERSION
U1
Vin
Vout / Iout
DC761A-A
LTC3204EDC-5
3.1V-5.5V
5V/150mA
2.7V-5.5V
5V/65mA
DC761A-B
LTC3204EDC-3.3
1.9V-4.5V
3.3V/50mA
1.8V-4.5V
3.3V/40mA
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ENGINEER Walker Bai 9/2/04
DESIGNER
Thursday, November 04, 2004
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TITLE
LTC3204EDC, Low Noise Regulated Charge Pump in 2x2 DFN
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DC761A
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A
SCALE:
FILENAME:
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