DEMO CIRCUIT 1277
QUICK START GUIDE

LTC3670
Monolithic 400mA Buck Regulator with Dual 150mA LDOs in 3mm × 2mm DFN

DESCRIPTION

The LTC®3670 is a triple power supply composed of a 400mA synchronous buck regulator and two 150mA low dropout linear regulators (LDOs). The input supply range of 2.5V to 5.5V is especially well-suited for single-cell Lithium-Ion and Lithium-Ion/Polymer applications and for powering low voltage ASICs and SoCs from 3V, 3.3V or 5V rails.

Regulated output voltages are programmed via external resistors. Each output has its own enable pin for maximum flexibility.

The 400mA buck regulator features constant-frequency 2.25MHz operation, allowing small surface mount inductors and capacitors to be used. Burst Mode operation maintains high efficiency in light-load and no-load conditions. Internal control-loop compensation simplifies application design.

TABLE 1: PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
VIN	Input voltage Range	* Subject to LDO Dropout Requirements	2.5*		5.5	V
VOUT1	Output of regulator (buck) 1	$I_{OUT1} \leq 400mA$	1.164	1.2	1.236	V
VOUT2	Output of LDO1	$I_{OUT2} \leq 150mA$. Subject to dropout limitations.	2.716	2.8	2.884	V
VOUT3	Output of LDO2	IOUT3 ≤ 150mA	3.2	3.3	3.4	V

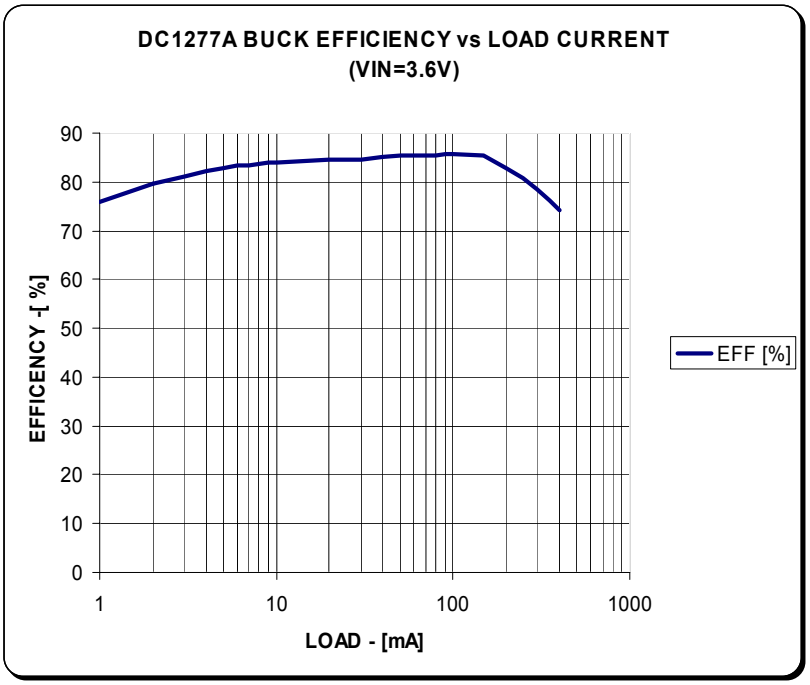


Figure 1. Efficiency of Buck Regulator, VOUT1, at VIN = 3.6 Volts

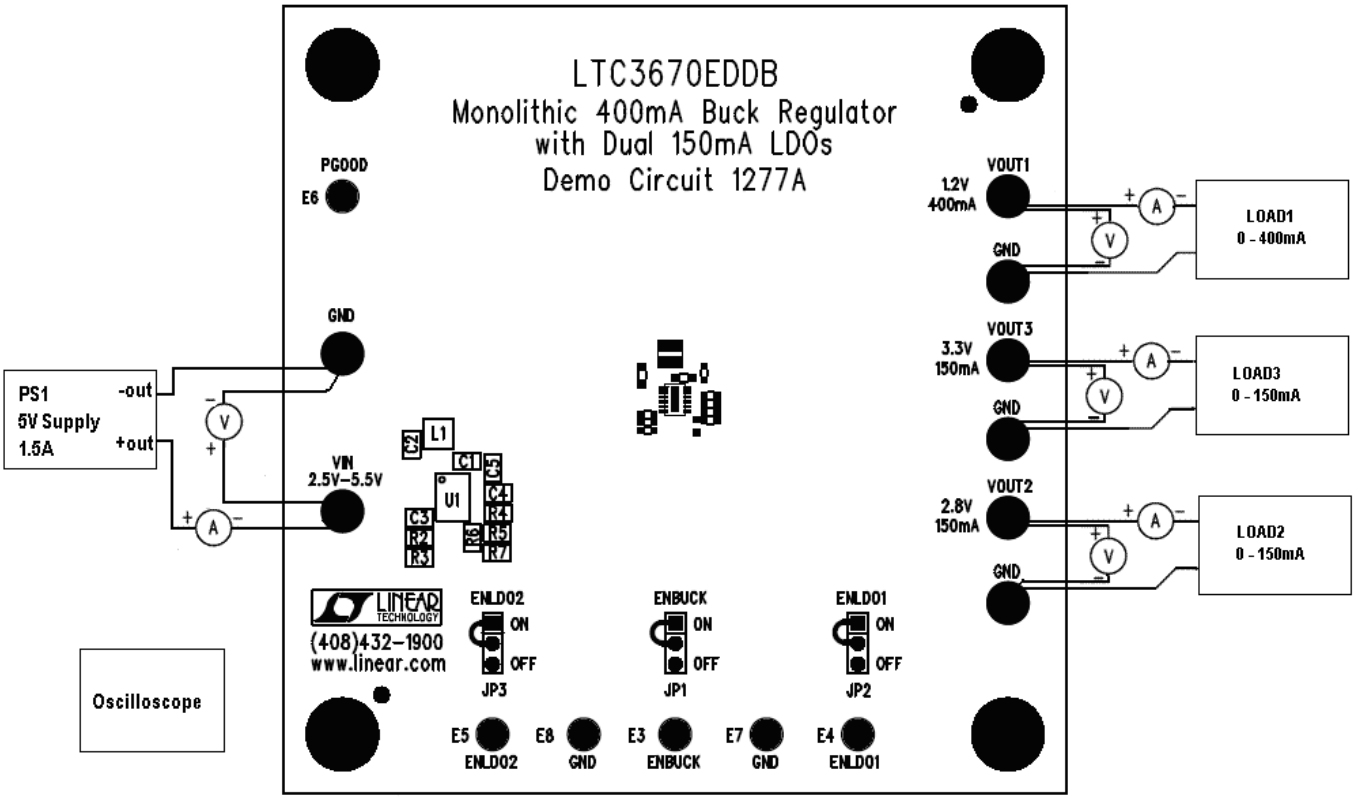


Figure 2. Test Equipment Hookup Diagram for DC1277A Demo Circuit

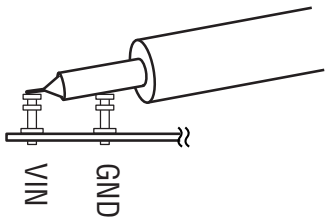


Figure 3. Measuring Input or Output Ripple

QUICK START PROCEDURE

Short twisted pair leads should be used for all power connections. Starting with all test equipment off and set to zero Volts or Amperes, refer to Figure 2 for the proper measurement and equipment setup (including the starting location for the jumpers).

1. Turn on all the loads. Set LOAD1 = 300mA, LOAD2 = 100mA and LOAD3 = 100mA. Turn on PS1 and set PS1 current limit to 1A. Adjust PS1 so the voltage across VIN and GND at the DUT is equal to 5.0 Volts.

2. Observe the voltages on VOUT1, VOUT2, VOUT3, VIN and the current through PS1.

3. Adjust PS1 so the voltage across the VIN and GND turrets is equal to 3.60 Volts. Observe the voltages on VOUT1, VOUT2, VOUT3, and the current through PS1.

4. Using an oscilloscope probe with a short ground connection, see Figure 3, measure the peak-to-peak ripple voltage on VOUT1, VOUT2 and VOUT3.

5. Observe the voltage on PGOOD. The PGOOD signal will be high after the enabled outputs reach 92% of their final value.

6. Set LOAD1 = LOAD2 = LOAD3 = 0.00A. Measure the voltages on VOUT1, VOUT2 and VOUT3.

7. Using an oscilloscope probe with a short ground connection, see Figure 3, measure the peak-to-peak ripple voltage on VOUT1, VOUT2 and VOUT3.

8. SET Jumpers ENLDO1 = ENLDO2 = ENBUCK = "OFF".

9. Measure the voltages on VOUT1, VOUT2, VOUT3 and PGOOD.

10. Turn off PS1 and set the jumpers to their default position "ON".

APPLICATION INFORMATION

This demonstration circuit is designed to demonstrate the full capability of the device. Not all components are required in all applications. The critical circuit components are on the top of the board near the IC.

The input capacitor network of C6 and R8 is used to dampen input source inductances that commonly occur in laboratory setups with twisted leads and a bench power supply. When using a closely coupled power source this input damping network will likely not be required.

Figures 4 and 5 show the startup and shutdown operation of the DC1277A with either the Enable lines being toggled high as VIN is present or with the enable lines tied to VIN.

The inductor for the Buck regulator was selected for its optimal size verse performance. Slightly higher efficiency results could be achieved especially at higher output currents by selecting a larger inductor with lower DC resistance. Please refer to the datasheet for a list of other recommended inductors.

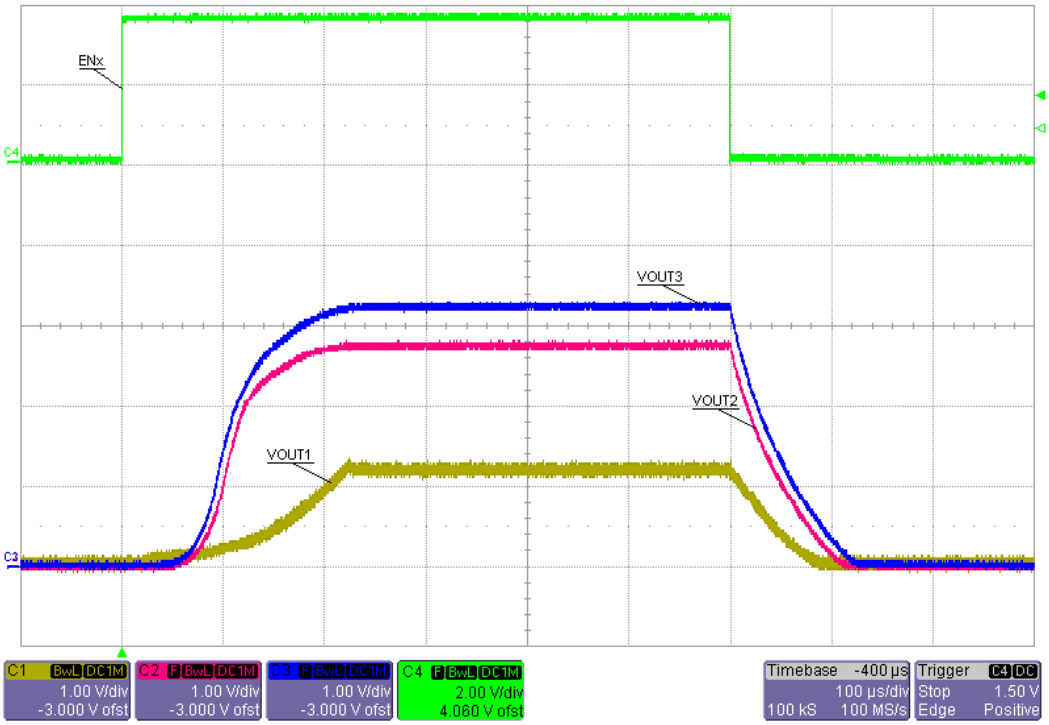


Figure 4. Startup and Shutdown Waveforms Using the Enable Signals (VIN = 3.6V, ILOAD = 0.5*Imax for all outputs)

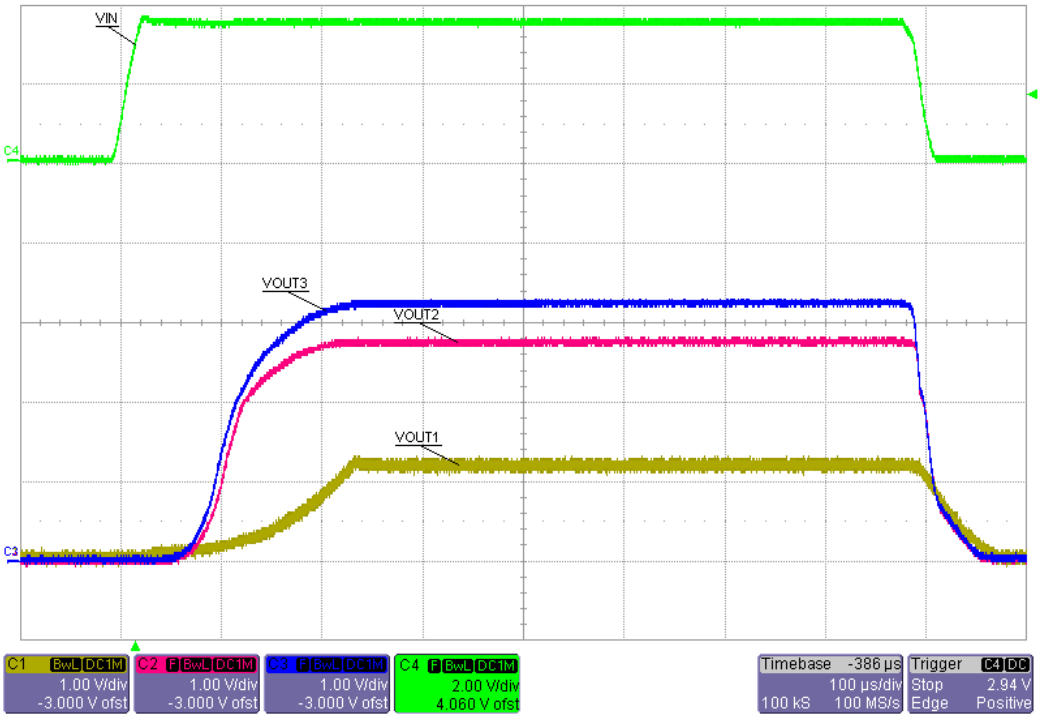


Figure 5. Startup and Shutdown with VIN Applied and Removed (ILOAD = 0.5*Imax for all outputs, ENx = VIN).

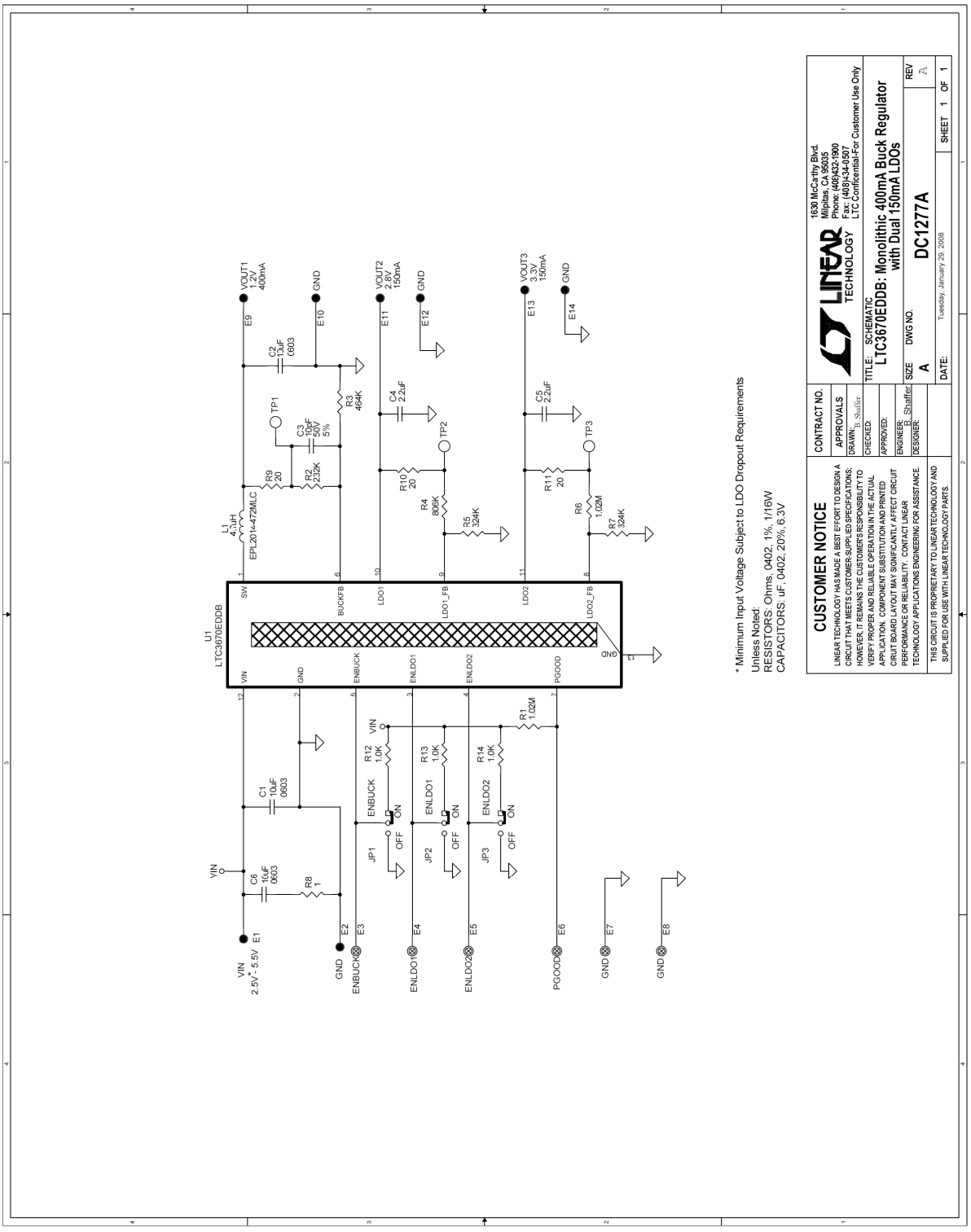


Figure 6: Schematic of DC1277A: LTC3670EDDB Monolithic 400mA Buck Regulator with Dual 150mA LDOs

Linear Technology Corp.
LTC3670EDDB

Parts List

Bill Of Material
Demo Circuit 1277A, Rev A
4/14/2008

Item	Qty	Reference - Des	Part Description	Manufacturer, Part #
REQUIRED CIRCUIT COMPONENTS:				
1	1	C1	CAP, CHIP, X5R, 10uF, 20%, 6.3V, 0603	MURATA, GRM188R60J106ME47
2	1	C2	CAP, CHIP, X5R, 10uF, 20%, 6.3V, 0603	TDK, C1608X5R0J106M
3	1	C3	CAP, CHIP, U2J, 10pF, 5%, 50V, 0402	MURATA, GRM1557U1H100JZ01D
4	2	C4,C5	CAP, CHIP, X5R, 2.2uF, 20%, 4V, 0402	MURATA, GRM155R60G225ME15D
5	1	R2	RES, 0402, 232KΩ, 1%, 1/16W	VISHAY, CRCW0402232KFKED
6	1	R3	RES, 0402, 464KΩ, 1%, 1/16W	VISHAY, CRCW0402464KFKED
7	1	R4	RES, 0402, 806KΩ, 1%, 1/16W	VISHAY, CRCW0402806KFKED
8	2	R5, R7	RES, 0402, 324KΩ, 1%, 1/16W	VISHAY, CRCW0402324KFKED
9	1	R6	RES, 0402, 1.02MΩ 1% 1/16W	VISHAY, CRCW04021M02FKED
10	1	L1	INDUCTOR, 4.7uH, 0.25 Ohms, 0.88A	COILCRAFT, EPL2014-472MLC
11	1	U1	400mA BUCK W/ DUAL 150mA LDOs	LINEAR TECH, LTC3670EDDB
ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:				
1	1	C6	CAP, CHIP, X5R, 10uF, 20%, 6.3V, 0603	MURATA, GRM188R60J106ME47
2	1	R1	RES, 0402, 1.02MΩ, 1%, 1/16W	VISHAY, CRCW04021M02FKED
3	1	R8	RES, 0402, 1Ω, 5%, 1/16W	VISHAY, CRCW04021R00JNED
4	3	R9,R10,R11	RES, 0402, 20.0Ω, 1%, 1/16W	VISHAY, CRCW040220R0FNED
5	3	R12,R13,R14	RES, 0402, 1.00KW, 1%, 1/16W	VISHAY, CRCW04021K00FKED
HARDWARE FOR DEMO BOARD ONLY:				
1	3	JP1,JP2,JP3	HEADER,3 PINS, 2mm	SAMTEC, TMM-103-02-L-S
2	3	JP1,JP2,JP3	SHUNT, 2mm	SAMTEC, 2SN-BK-G
3	8	E1,E2,E9,E10,E11,E12,E13,E14	TURRET, 0.09 DIA	MILLMAX, 2501-2
4	6	E3,E4,E5,E6,E,E8	TURRET, 0.061 DIA	MILLMAX, 2308-2
5	4		STAND-OFF, NYLON 0.25" tall (SNAP ON)	KEYSTONE, 8831 (SNAP ON)

Table 2: Bill Of Materials