DESCRIPTION

Demonstration circuit 893A is a triple output converter, using the LTC3446 monolithic synchronous buck regulator with dual very low drop-out linear regulators (VLDOs). The DC893A has an input voltage range of 2.7V to 5.5V, and is capable of delivering up to 300 mA of load current on each output. The buck regulator output voltage of the DC893A can be set as low as 0.8V, and the dual VLDOs can be set as low as 0.4V. The DC893A can operate in noise sensitive applications, due to the LTC3446 buck regulator operating in pulse-skipping mode at low load currents. This feature, together with the inherent low noise operation of the VLDOs, allows the DC893A to provide three reasonably quiet outputs. The DC893A is meant for powering sub-2V logic circuits and I/O circuitry from a single Li-Ion battery. With the dual VLDOs running off the output voltage of the buck regulator, the efficiency of the linear regulators can rival that of the buck regulator. These features make the DC893A an ideal circuit for use in Battery powered, hand-held applications.

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

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

PARAMETER	CONDITIONS	VALUE
Minimum Input Voltage		2.7V
Maximum Input Voltage		5.5V
Run/Shutdown	GND = Shutdown	
	V_{IN} = Run	
Output Voltage $V_{OUTBUCK}$	V_{IN} = 2.7V to 5.5V, $I_{OUTBUCK}$ = 0 mA to 400 mA	1.8V ±~5% (1.7V – 1.9V)
Output Voltage Regulation $V_{OUTBUCK}$	Line	±1.5%
	Load	±1.5%
Typical Output Ripple $V_{OUTBUCK}$	V_{IN} = 3.3V, $I_{OUTBUCK}$ = 400 mA (20 MHz BW)	< 40m$V_{P–P}$
Nominal Switching Frequency		2.25 MHz
Operation Modes	Burst Mode - V_{IN} = 3.3V, $V_{OUTBUCK}$ = 1.8V	<0.4A ±0.1A%
	Pulse-Skipping - V_{IN} = 3.3V, $V_{OUTBUCK}$ = 1.8V	<0.2A ± 50 mA%
Output Voltage $V_{OUTLDO1}$	V_{IN} = 2.9V to 5.5V, I_{OUT1} = 0 mA to 300 mA	1.5V ±~5% (1.4V - 1.6V)
Output Voltage Regulation $V_{OUTLDO1}$	Line	±1.5%
	Load	±1.5%
Typical Output Ripple $V_{OUTLDO1}$	V_{IN} = 3.3V, $I_{OUTLDO1}$ = 300 mA (20 MHz BW)	< 20m$V_{P–P}$
Output Voltage $V_{OUTLDO2}$	V_{IN} = 2.7V to 5.5V, $I_{OUTLDO2}$ = 0 mA to 300 mA	1.2V ±~5% (1.125V - 1.275V)
Output Voltage Regulation $V_{OUTLDO2}$	Line	±1.5%
	Load	±1.5%
Typical Output Ripple $V_{OUTLDO2}$	V_{IN} = 3.3V, $I_{OUTLDO2}$ = 300 mA (20 MHz BW)	< 20m$V_{P–P}$

QUICK START PROCEDURE

The DC893 is easy to set up to evaluate the performance of the LTC3446. For a proper measurement equipment configuration, set up the circuit according to the diagram in Figure 1.

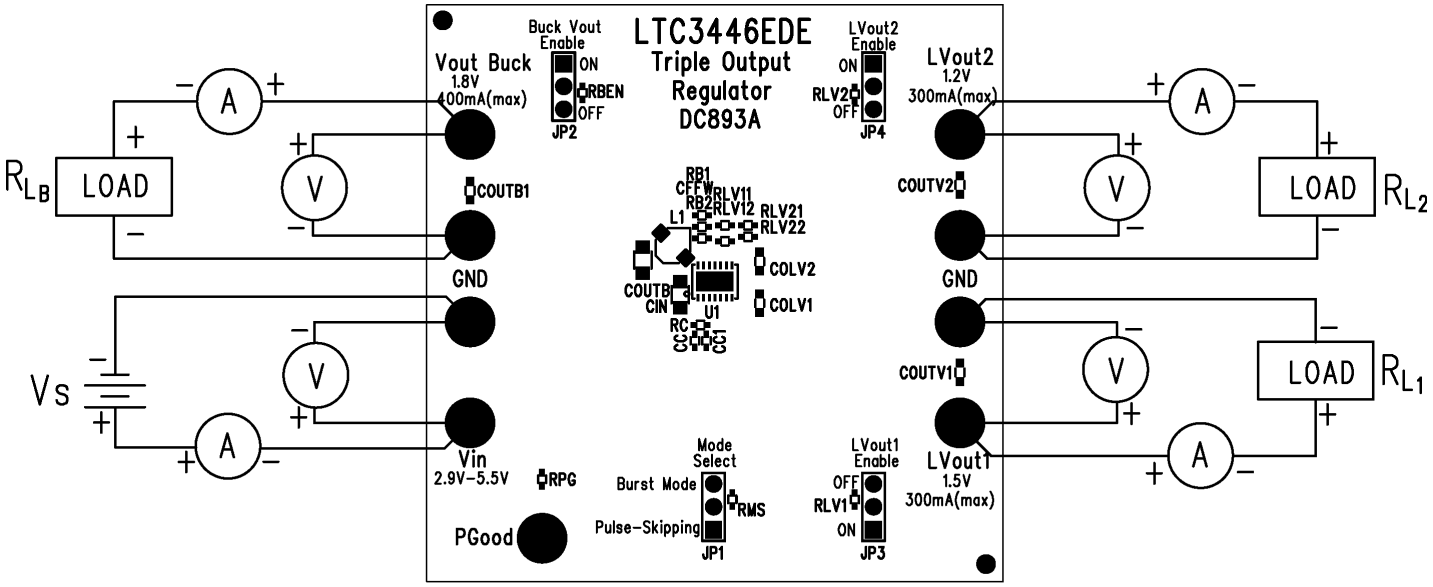
NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the Vin or Vout and GND terminals. See the probe measurement diagram in Figure 2 for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

Please follow the procedure outlined below for proper operation.

1. Connect the input power supply to the Vin and GND terminals. Connect the loads between the Vout and GND terminals. Refer to figure 1 for the proper measurement equipment setup.
2. Before proceeding to operation, insert shunt XJP1 into the pulse-skip position of jumper JP1. Also, insert shunts XJP2, XJP3, and XJP4 into the OFF positions of jumpers JP2, JP3, and JP4, respectively.
3. Apply 5V at Vin, and turn on VoutBuck, LVout1, and LVout2 by changing shunts XJP2, XJP3, and XJP4 from the OFF positions to the ON positions. All three output voltages should be within a tolerance of +/- 2.5%.
4. Vary the input voltage from 2.9V to 5V. The three output voltages should be within +/- 3.5% tolerance.
5. Vary the load current, of each output, from 0 to full load (400 mA for VoutBuck, 300 mA for LVout1 and LVout2). Each output voltage should be within a tolerance of +/- 5%.
6. Set the load current of all outputs to full load and measure the ripple voltage of each output (refer to Figure 2 for proper measurement technique); they should measure less than 40 mVAC each. Also, observe the voltage waveform of the VoutBuck regulator at the switch node (pin 14). The switching frequency should be between 1.8 MHz and 2.7 MHz (T = 555 ns and 370s).
7. Insert shunts XJP2, XJP3, and XJP4 into the OFF position(s). Move shunt XJP1 into the Burst-Mode position. Turn on VoutBuck by moving shunt XJP2 into the on position and lower the load current to less than 40 mA. Observe the output ripple voltage. It should measure less than 100 mVAC.
8. Measure the output voltage; it should measure +/- 2.5% tolerance for static line and load conditions and +/- 6% tolerance under dynamic line and load conditions (3.5% total).

   When finished, turn off the VoutBuck circuit by inserting a shunt into the OFF position of JP2, and disconnect the power.

Warning - If the power for the demo board is carried in long leads, the input voltage at the part could “ring”, which could affect the operation of the circuit or even exceed the maximum voltage rating of the IC. To eliminate the ringing, insert a small tantalum capacitor (for instance, AVX part # TAJW476M010) on the pads between the input power and return terminals on the bottom of the demo board. The (greater) ESR of the tantalum will dampen the (possible) ringing voltage due to the use of long input leads. On a normal, typical PCB, with short traces, the capacitor is not needed.



SET–UP DIAGRAM

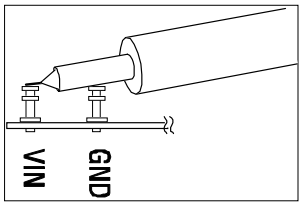
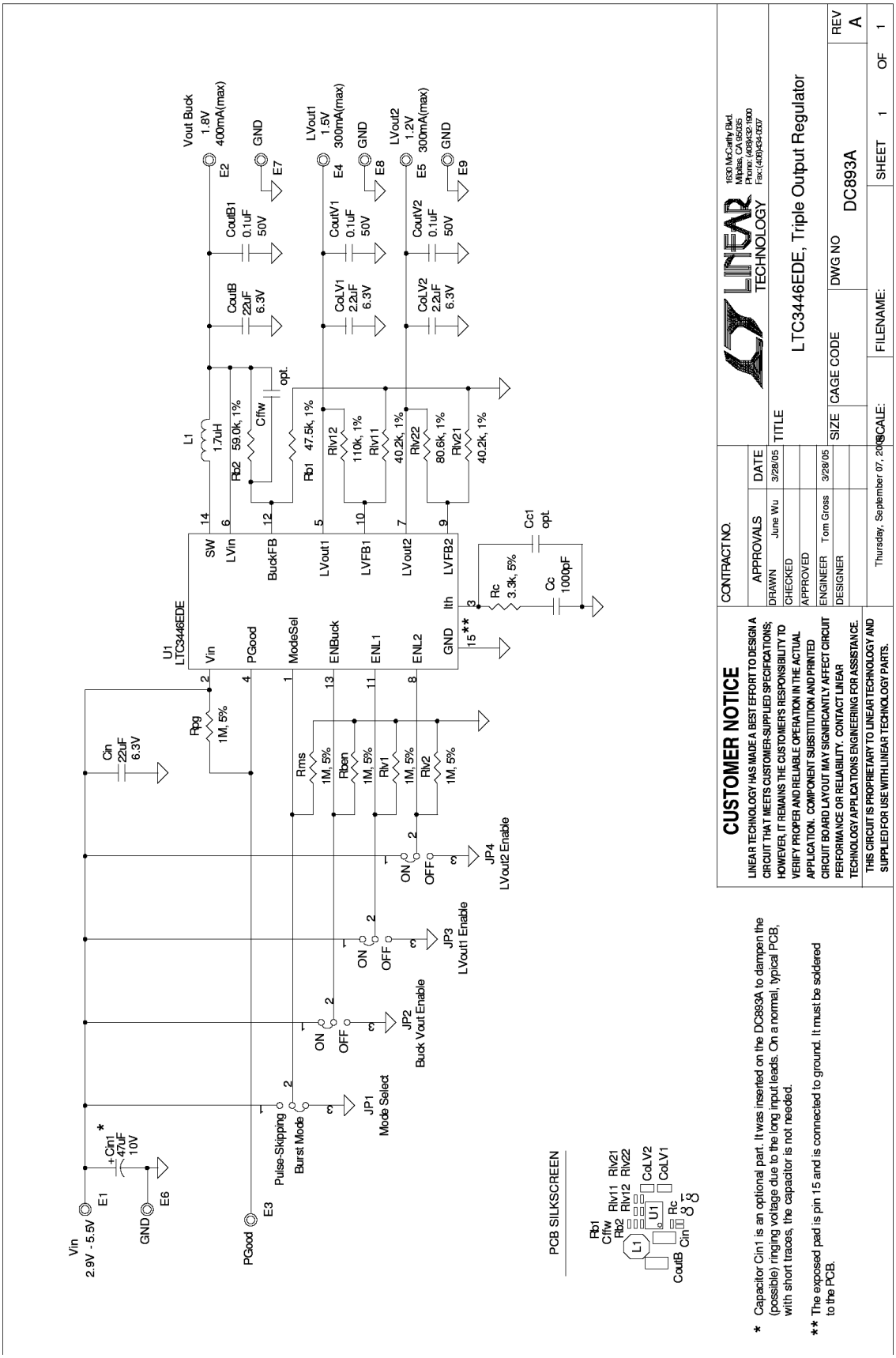


Figure 1. Measuring Input or Output Ripple


Vin
2.9V - 5.5V
E1
+Cin1 *
47uF
10V
GND
E6
PGood
E3
Pulse-Skipping
Burst Mode
JP1
Mode Select
JP2
Buck Vout Enable
JP3
LVout1 Enable
JP4
LVout2 Enable
Cin
22uF
6.3V
Rpg
1M, 5%
Rms
1M, 5%
Rben
1M, 5%
Rlv1
1M, 5%
Rlv2
1M, 5%
U1
LTC3446EDE
Vin
PGood
ModeSel
ENBuck
ENL1
ENL2
GND
SW
LVin
BuckFB
LVout1
LVFB1
LVout2
LVFB2
Ith
L1
1.7uH
Rb2 59.0k, 1%
Cffw
opt.
Rb1 47.5k, 1%
Rlv12
110k, 1%
Rlv11
40.2k, 1%
Rlv22
80.6k, 1%
Rlv21
40.2k, 1%
Rc
3.3k, 5%
Cc
1000pF
Cc1
opt.
**
Vout Buck
1.8V
400mA(max)
E2
GND
E7
CoutB1
0.1uF
50V
CoutB
22uF
6.3V
LVout1
1.5V
300mA(max)
E4
GND
E8
CoutV1
0.1uF
50V
CoLV1
2.2uF
6.3V
LVout2
1.2V
300mA(max)
E5
GND
E9
CoutV2
0.1uF
50V
CoLV2
2.2uF
6.3V
PCB SILKSCREEN
Rb1
Cffw
Rb2
Rlv11
Rlv12
Rlv21
Rlv22
CoLV2
CoLV1
L1
U1
Rc
Cin
CoutB
* Capacitor Cin1 is an optional part. It was inserted on the DC893A to dampen the (possible) ringing voltage due to the long input leads. On a normal, typical PCB, with short traces, the capacitor is not needed.
** The exposed pad is pin 15 and is connected to ground. It must be soldered to the PCB.
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CONTRACT NO.
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Thursday, September 07, 2006
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TITLE
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SIZE CAGE CODE DWG NO DC893A REV A
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