QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 799
SYNCHRONOUS BUCK-BOOST CONVERTER WITH AUTOMATIC BURST MODE

LTC3442EDE

DESCRIPTION

Demonstration Circuit 799 is a high efficiency synchronous Buck-Boost converter using the LTC3442. The input range is from 2.4V to 5.5V, making it ideal for single-cell Lithium-Ion or three-cell NiCd/NiMH battery applications. This converter provides up to 95% efficiency, much higher than traditional Buck-Boost converters. For 2.7V minimum input voltage, this converter can provide up to 1.2A load current.

The output voltage is set at 3.3V. A different output voltage in the range of 2.4V to 5.25V can be obtained by changing one of the feedback resistors. The switching frequency is set at 1MHz, which is a good trade-off between efficiency and size. Adjusting RT can program the frequency between 300kHz to 2MHz. In shutdown, the IC itself draws less than 1μA.

The LTC3442 has manual or programmable Automatic Burst Mode operation and programmable average input current limit.

When using long wire connections to the input source (such as wall adaptors), there can be input over voltage transients during initial plug-in. C2 is installed on DC799 to damp the possible voltage transients. C2 is not needed for any application when the input source is close to the regulator. Please refer to Application Note 88 for details.

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

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

PARAMETER	CONDITION	VALUE
Minimum Input Voltage	-40°C to 85°C	2.4V
Maximum Input Voltage	-40°C to 85°C	5.5V
Output Voltage V_{OUT}	V_{IN} = 2.5V to 5.5V, I_{OUT} = 0A to 1.1A	3.3V ±4%
Maximum Output Current	V_{IN} = 2.5V	1.1A
Maximum Output Current	V_{IN} = 2.7V	1.2A
Typical Output Ripple V_{OUT}	V_{IN} = 3.6V, I_{OUT} = 1.1A (20MHz BW)	45mV_{PP}
Typical Switching Frequency	RT=43.2K	1MHz
Efficiency (Fixed Frequency Mode)	V_{IN} = 4.2V, I_{OUT} = 0.2A	93% Typical
	V_{IN} = 4.2V, I_{OUT} = 1.0A	90% Typical
On/Off Control	Off (40°C to 85°C)	0.4V MAX
	On (-40°C to 85°C)	1.4V MIN

QUICK START PROCEDURE

Demonstration circuit 799 is easy to set up to evaluate the performance of the LTC3442. 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 jumpers in the following positions:

   JP1 RUN

   JP2 DISABLE

   JP3 AUTO ON

2. With power off, connect the input power supply to Vin and GND.

3. Turn on the power at the input.

   NOTE: Make sure that the input voltage does not exceed 5.5V.

4. Check for the proper output voltage. Vout = 3.17V to 3.43V.

   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

5. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

GRAPHICS

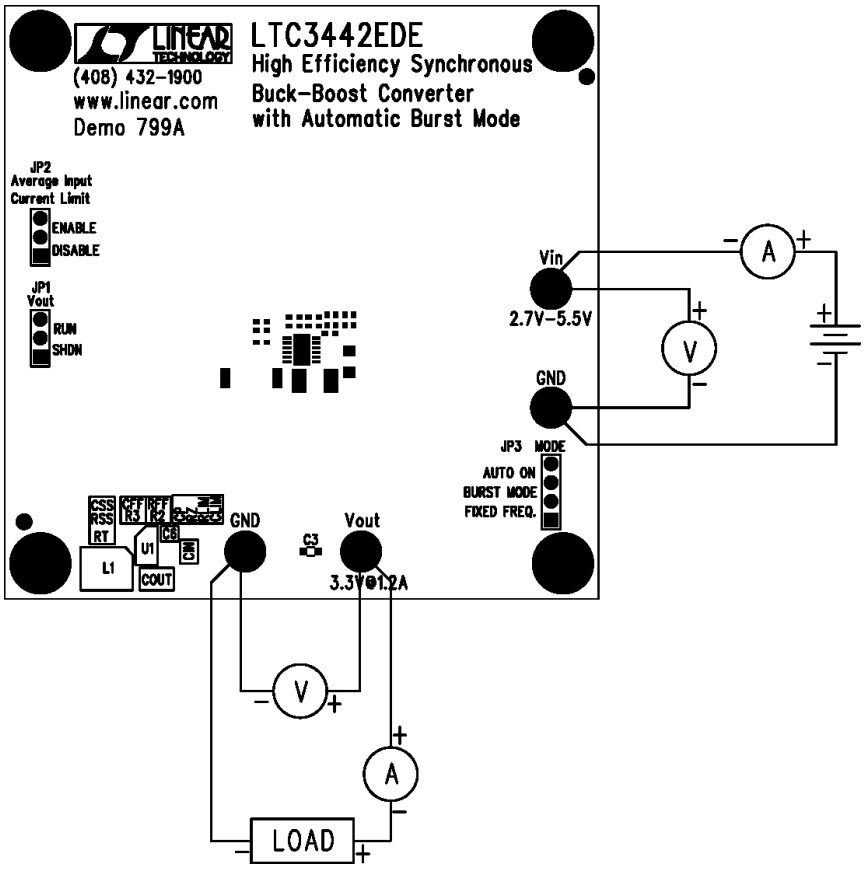


Figure 1. Proper Measurement Equipment Setup

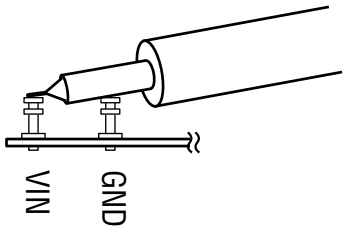


Figure 2. Measuring Input or Output Ripple

Efficiency vs. Load

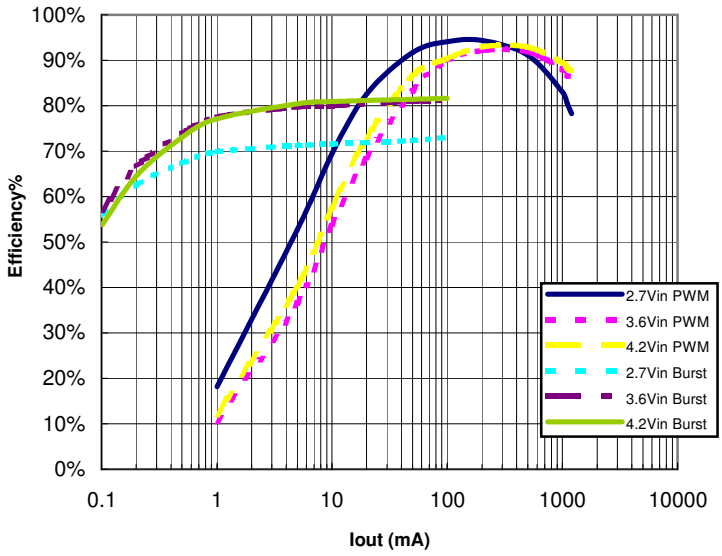


Figure 3. Efficiency of DC799

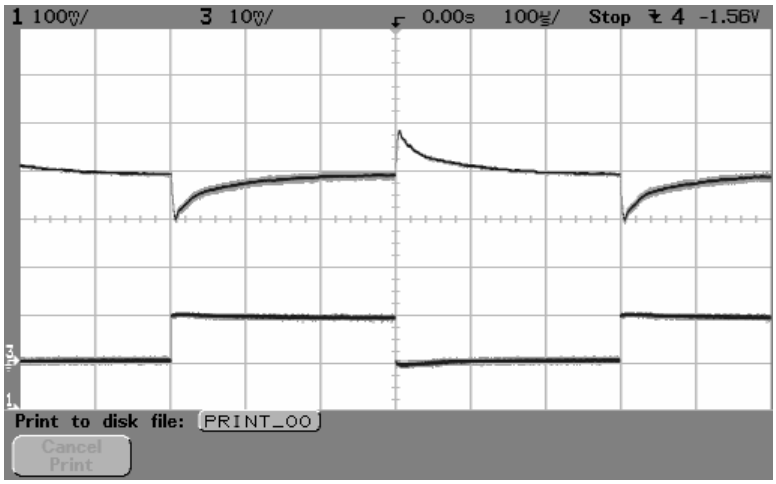
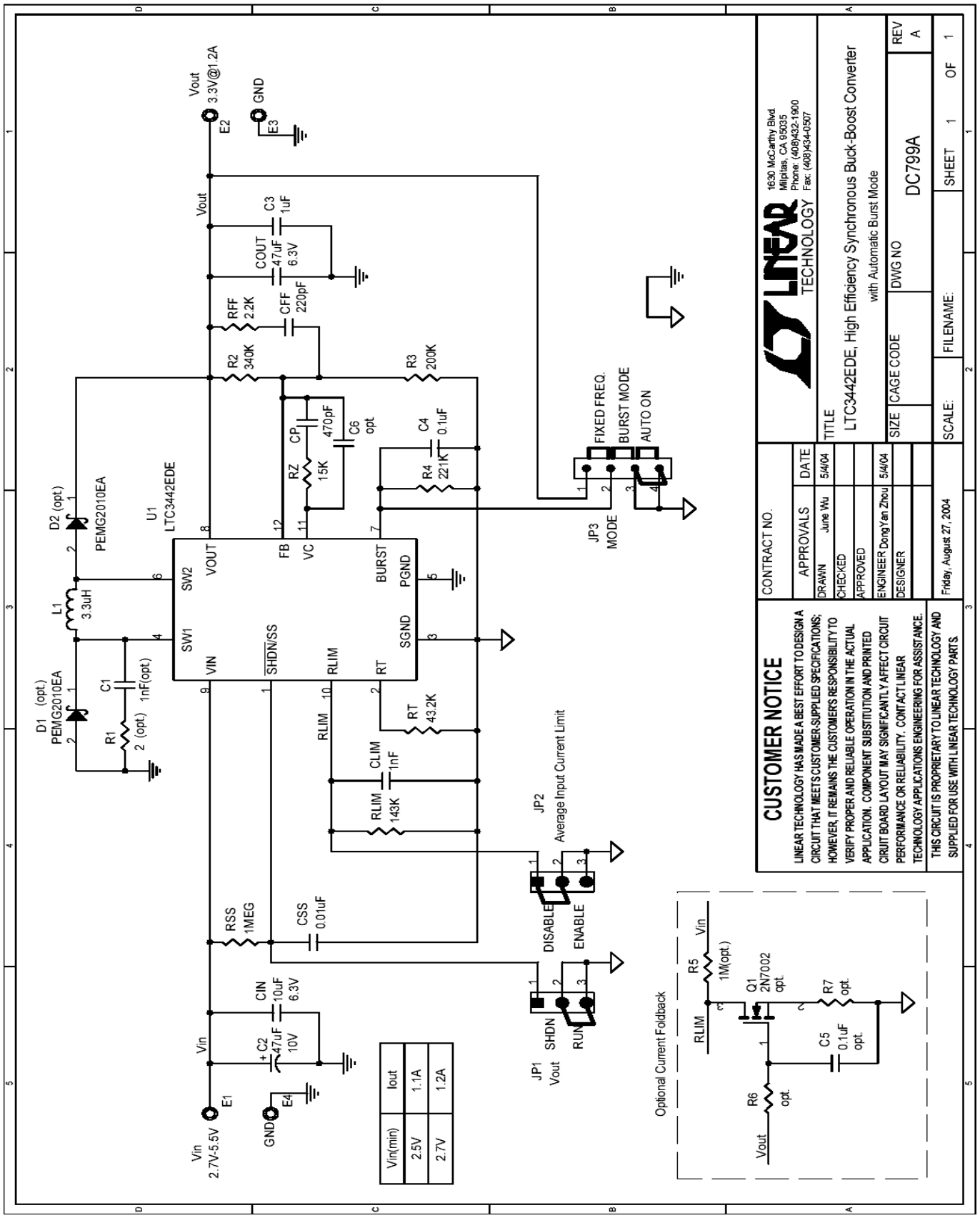


Figure 4. Load Transient Response (Vin=3.6V; top trace: Vout, 100mV/div; bottom trace: Iout load step: 200mA to 1.2A)


Vout
3.3V@1.2A
E2
GND
E3
Vout
C3
1uF
COUT
47uF
6.3V
RFF
2.2K
CFF
220pF
R2
340K
R3
200K
C6
opt
CP
470pF
RZ
15K
C4
0.1uF
R4
221K
D2 (opt)
PEMG2010EA
U1
LTC3442EDE
L1
3.3uH
D1 (opt.)
PEMG2010EA
C1
1nF(opt)
R1
2 (opt.)
SW2
VOUT
FB
VC
BURST
SW1
VIN
SHDN/SS
RLIM
RT
SGND
PGND
FIXED FREQ.
BURST MODE
AUTO ON
JP3
MODE
RT
43.2K
CLIM
1nF
RLIM
143K
JP2
Average Input Current Limit
RSS
1MEG
CSS
0.01uF
DISABLE
ENABLE
CIN
10uF
6.3V
+ C2
47uF
10V
Vin
E1
GND
E4
Vin
2.7V-5.5V
JP1
Vout
SHDN
RUN
Optional Current Foldback
R5
1M(opt.)
Vin
RLIM
Q1
2N7002
opt.
R7
opt.
C5
0.1uF
opt.
R6
opt.
Vout
Vin(min)
Iout
2.5V
1.1A
2.7V
1.2A
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THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
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TITLE
LTC3442EDE, High Efficiency Synchronous Buck-Boost Converter
with Automatic Burst Mode
SIZE
CAGE CODE
DWG NO
DC799A
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A
SCALE:
FILENAME:
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