

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 797

1MHZ SYNCHRONOUS BUCK-BOOST IN 3MM X 3MM DFN

LTC3440EDD

DESCRIPTION

Demonstration Circuit 797 is a constant-frequency synchronous Buck-Boost converter using the LTC3440EDD. The input range is from 2.5V 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 2.5V minimum input voltage, this converter can provide up to 540mA load current.

The output voltage is set at 3.3V. A different output voltage in the range of 2.5V 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. The frequency

can be modified by changing R6 or by synchronizing to an external clock. In shutdown, the IC itself draws less than 1 μ A.

When using long wire connections to the input sources (such as wall adaptors), there can be input over voltage transients during initial plug-in. C8 is installed on DC797 to damp the possible voltage transients. C8 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 ($T_A = -40^{\circ}\text{C}$ to 85°C unless otherwise noted)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		2.5V
Maximum Input Voltage		5.5V
Output Voltage V_{OUT}	$V_{IN} = 2.5\text{V to } 5.5\text{V}$, $I_{OUT} = 0\text{mA to } 540\text{mA}$	3.3V \pm 4%
Maximum Output Current	$V_{IN} = 2.5\text{V}$	540mA
Maximum Output Current	$V_{IN} = 2.7\text{V}$	600mA
Typical Output Ripple V_{OUT}	$V_{IN} = 2.5\text{V}$, $I_{OUT} = 500\text{mA}$ (20MHz BW)	12mV _{PP} (measured at C2)
		22mV _{PP} (measured across E4 and E5)
Typical Switching Frequency		1MHz
Efficiency (Fixed Freq.)	$V_{IN} = 4.2\text{V}$, $I_{OUT} = 100\text{mA}$	94% Typical
	$V_{IN} = 4.2\text{V}$, $I_{OUT} = 500\text{mA}$	91% Typical
On/Off Control	Off	0.4V MAX
	On	1.5V MIN

QUICK START PROCEDURE

Demonstration circuit 797 is easy to set up to evaluate the performance of the LTC3440EDD . 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 FIXED FREQ.

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.

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1MHz SYNCHRONOUS BUCK-BOOST CONVERTER IN 3MM X 3MM DFN

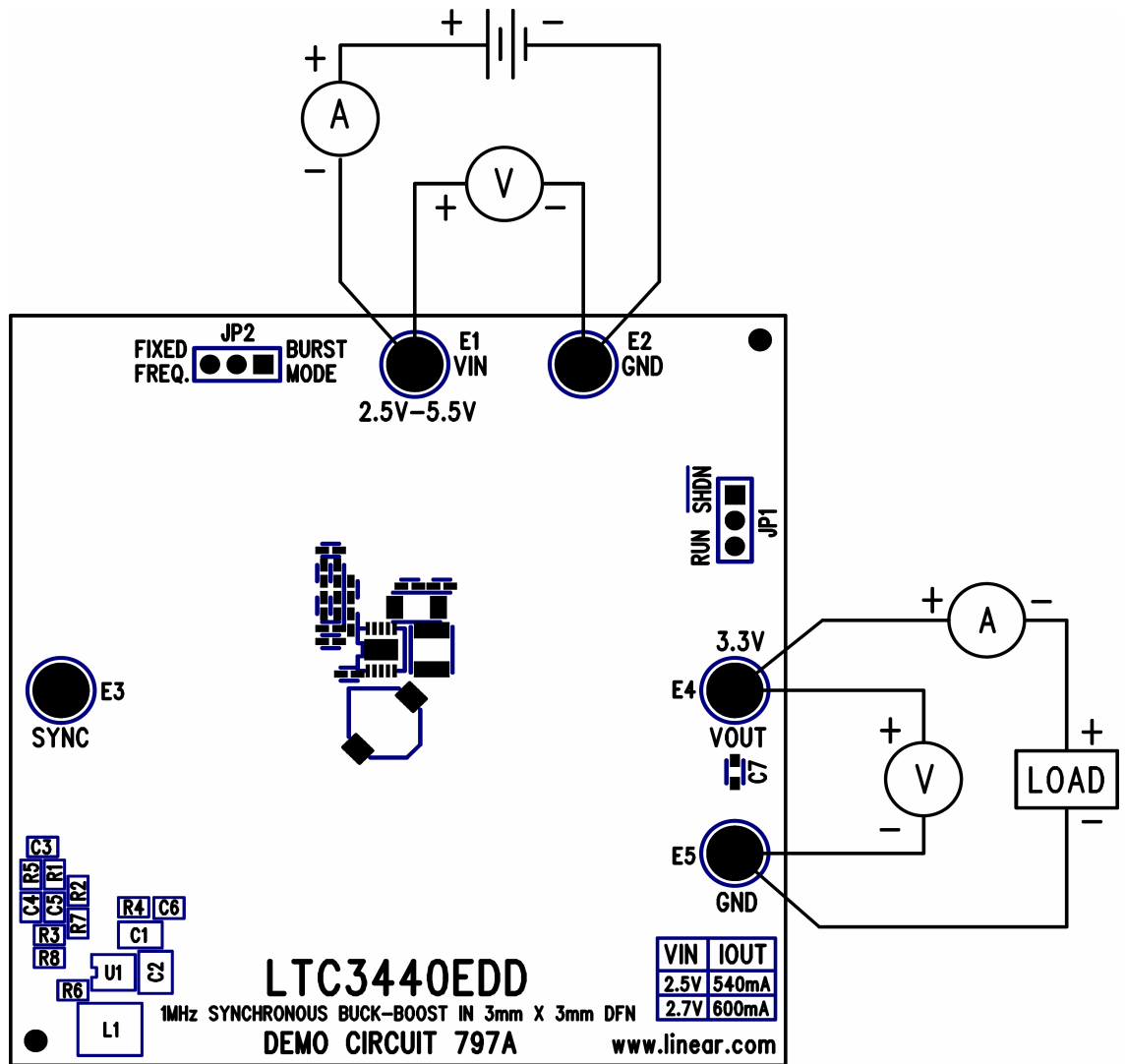


Figure 1. Proper Measurement Equipment Setup

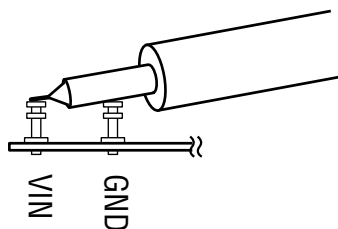


Figure 2. Measuring Input or Output Ripple

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Efficiency vs. Load

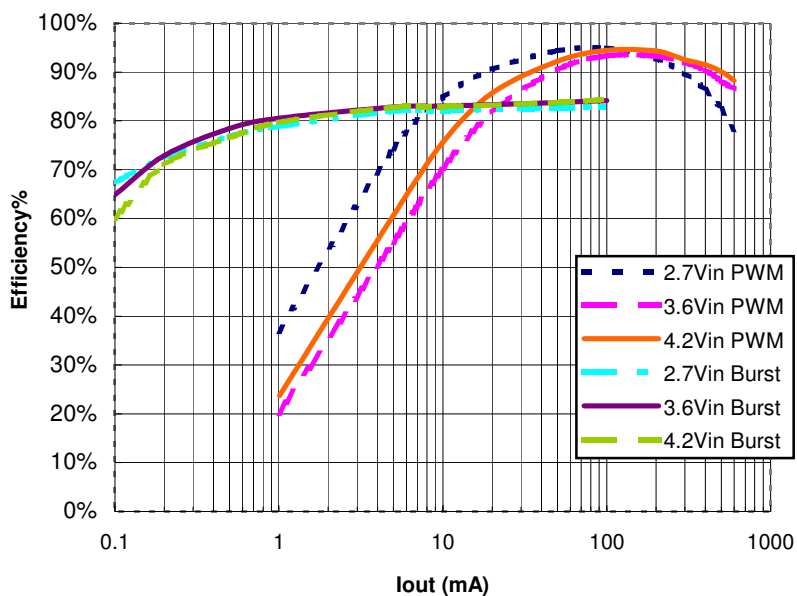


Figure 3. Efficiency of DC797

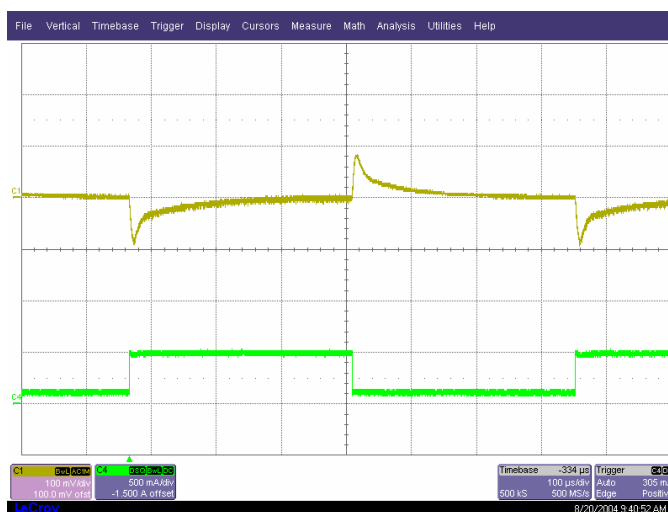
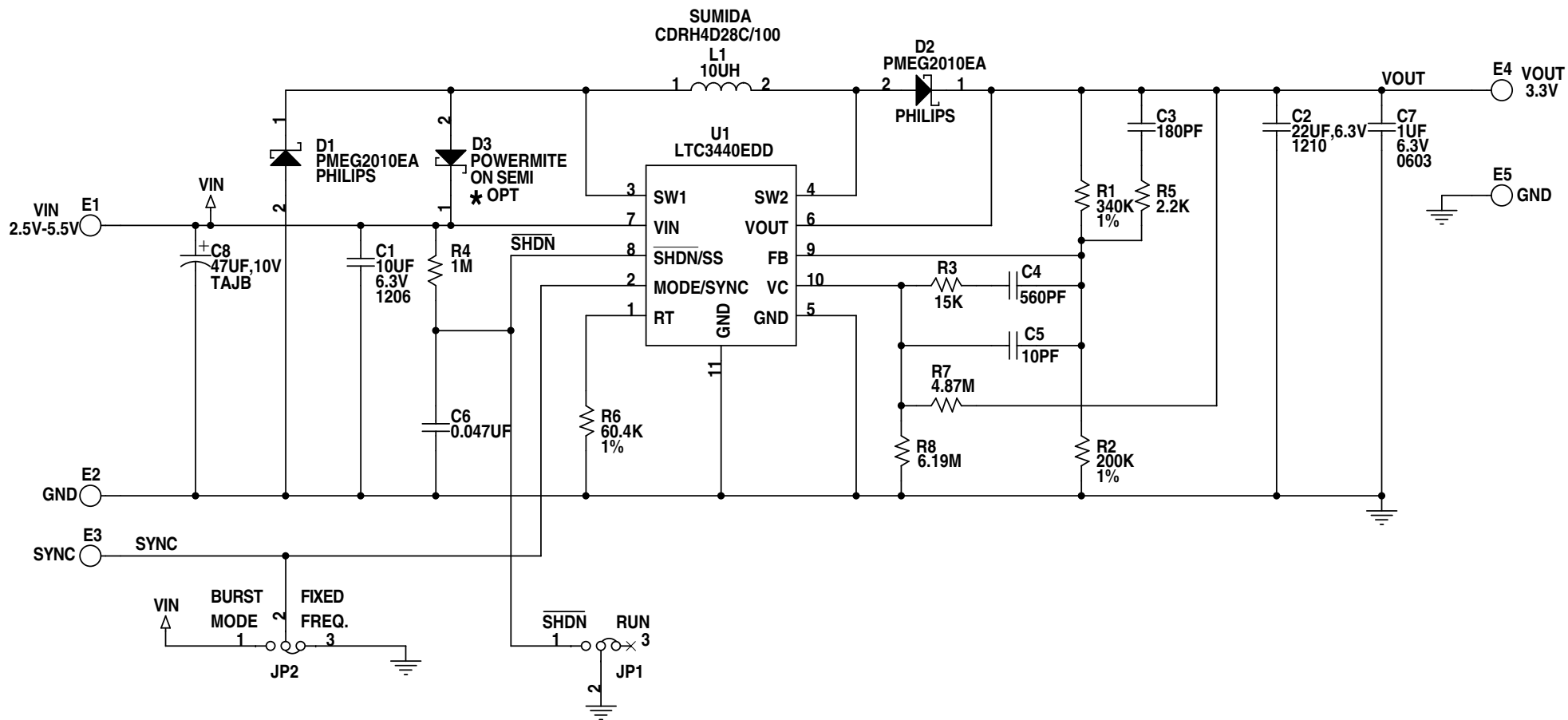


Figure 4. Load Transient Response (Vin=3.6V; Channel 1: Vout, 100mV/div; Channel 2: Iout load step: 100mA to 500mA)

* D3 IS RECOMMENDED FOR VIN>4.5V.
PLEASE REFER TO DATASHEET FOR DETAILS.



VIN	IOUT
2.5V	540mA
2.7V	600mA

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0402.
ALL CAPS. ARE 0402.
2. INSTALL SHUNTS ON JP1 AND JP2 PIN 2 AND 3.

CUSTOMER NOTICE

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

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

CONTRACT NO.

APPROVALS

DRAWN:

CHECKED: KIM T.

APPROVED:

ENGINEER:
DONGYAN Z.

DESIGNER:



1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
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TITLE:
1MHz SYNCHRONOUS BUCK-BOOST IN 3mm X 3mm DFN

SIZE A	DWG NO. DC797A-1*LTC3440EDD	REV A
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DATE: Friday, August 20, 2004

SHEET 1 OF 1

Linear Technology Corporation

LTC3440EDD

1MHz SYNCHRONOUS BUCK-BOOST IN 3mm X 3mm DFN

ENG.: DONGYAN ZHOU (23-30)

BILL OF MATERIALS

DC797A-1

6/20/2005

10:44 AM

Item	Qty	Reference	Part Description	Manufacture / Part #
1	1	C1	CAP., X5R, 10UF 6.3V,20%,1206	TAIYO YUDEN, JMK316BJ106ML
2	1	C2	CAP., X5R, 22UF 6.3V,1210	TAIYO YUDEN, JMK325BJ226MM
3	1	C3	CAP., X7R, 180PF 50V,0402	AVX, 04025C181MAT1A
4	1	C4	CAP., X7R, 560PF 50V,0402	AVX, 04025C561MAT1A
5	1	C5	CAP., NPO, 10PF 50V,0402	AVX, 04025A100KAT1A
6	1	C6	CAP., X5R, 0.047UF 10V	AVX, 0402ZD473MAT1A
7	1	C7	CAP., X5R 1UF 6.3V,20%,0603	TAIYO YUDEN, JMK107BJ105MA
8	1	C8	CAP., TANT, 47UF 10V, 3528	AVX, TAJB476M010
9	2	D1,D2	DIODE, SCHOTTKY,SOD323	PHILIPS, PMEG2010EA
10	1	D3	DIODE, SCHOTTKY,POWERMITE	ON SEMI, MBRM120ET3
11	5	E1,E2,E3,E4,E5	TP, TURRET, .094"	MILL-MAX, 2501-2
12	2	JP1,JP2	HEADER, 3PIN 1 ROW .079CC	COMM-CON, 2802S-03-G1
13	2	SHUNTS FOR JP1&JP2 PIN 2&3	SHUNT, 0.079" CENTER	COMM-CON, CCIJ2MM-138G
14	1	L1	IND, 10UH, L-CDRH4D28C	SUMIDA, CDRH4D28C/100
15	1	R1	RES, CHIP 340K, 1%,0402	AAC, CR05-3403FM
16	1	R2	RES, CHIP 200K, 1%,0402	AAC, CR05-2003FM
17	1	R3	RES, CHIP 15K, 5%,0402	AAC, CR05-153JM
18	1	R4	RES, CHIP 1M, 5%,0402	AAC, CR05-105JM
19	1	R5	RES, CHIP 2.2K, 5%,0402	AAC, CR05-222JM
20	1	R6	RES, CHIP 60.4K, 1%,0402	AAC, CR05-6042FM
21	1	R7	RES, CHIP 4.87M, 1%,0402	AAC, CR05-4874FM
22	1	R8	RES, CHIP 6.19M, 1%,0402	AAC, CR05-6194FM
23	1	U1	IC, LTC3440EDD, 10-LEAD DFN3X3, DFN10DD	LINEAR TECH. LTC3440EDD