DESCRIPTION

Demonstration Circuit 625 is a constant-frequency synchronous Buck-Boost converter using the LTC3441. 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 2.5V minimum input voltage, this converter can provide up to 1A 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. Applying twice the desired frequency at the MODE/SYNC pin can also synchronize the switching frequency between 1.15MHz to 1.7MHz. In shutdown, the IC draws less than 1μA.

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 DC625 to damp the possible voltage transients. C8 is not needed for any application when 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.

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

PARAMETER	CONDITION	VALUE
Minimum Input Voltage	-40°C to 85°C	2.4V (2.5V minimum input for 1A load)
Maximum Input Voltage	-40°C to 85°C	5.5V
Output Voltage V_{OUT}	V_{IN} = 2.5V to 5.25V, I_{OUT} = 0A to 1A	3.3V ±3%
Maximum Output Current	V_{IN} = 2.5V to 5.25V	1A
Typical Output Ripple V_{OUT}	V_{IN} = 3.0V, I_{OUT} = 1A (20MHz BW)	40mV$_{P-P}$
Typical Switching Frequency		1MHz
Efficiency	V_{IN} = 4.2V, I_{OUT} = 0.2A	94% Typical
	V_{IN} = 4.2V, I_{OUT} = 1A	89% Typical
On/Off Control	Logic Low Voltage-Off, -40°C to 85°C	0.4V MAX
	Logic High Voltage-On	2.4V MIN

QUICK START PROCEDURE

Demonstration circuit 625 is easy to set up to evaluate the performance of the LTC3441. 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 = 3.2V to 3.4V.

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.

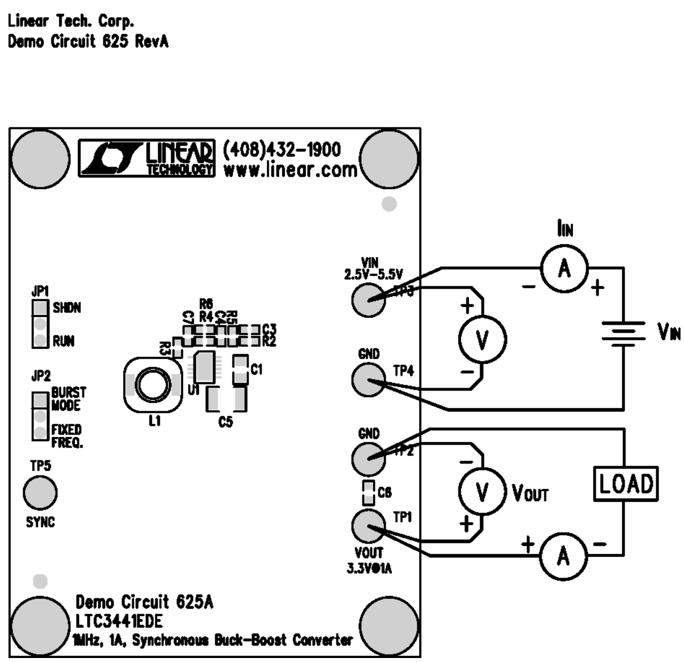


Figure 1. Proper Measurement Equipment Setup

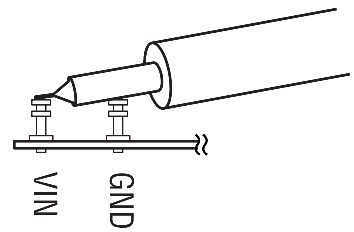


Figure 2. Measuring Input or Output Ripple

GRAPHICS

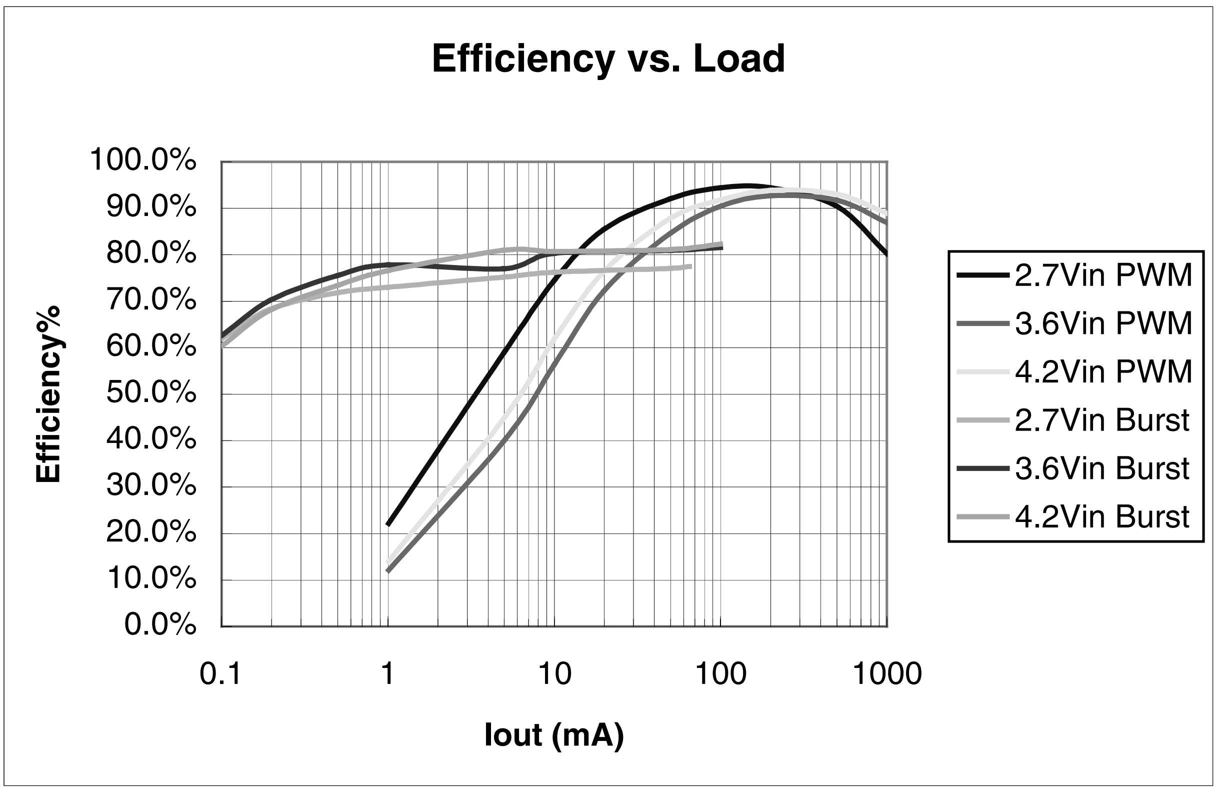


Figure 3. Efficiency of DC625

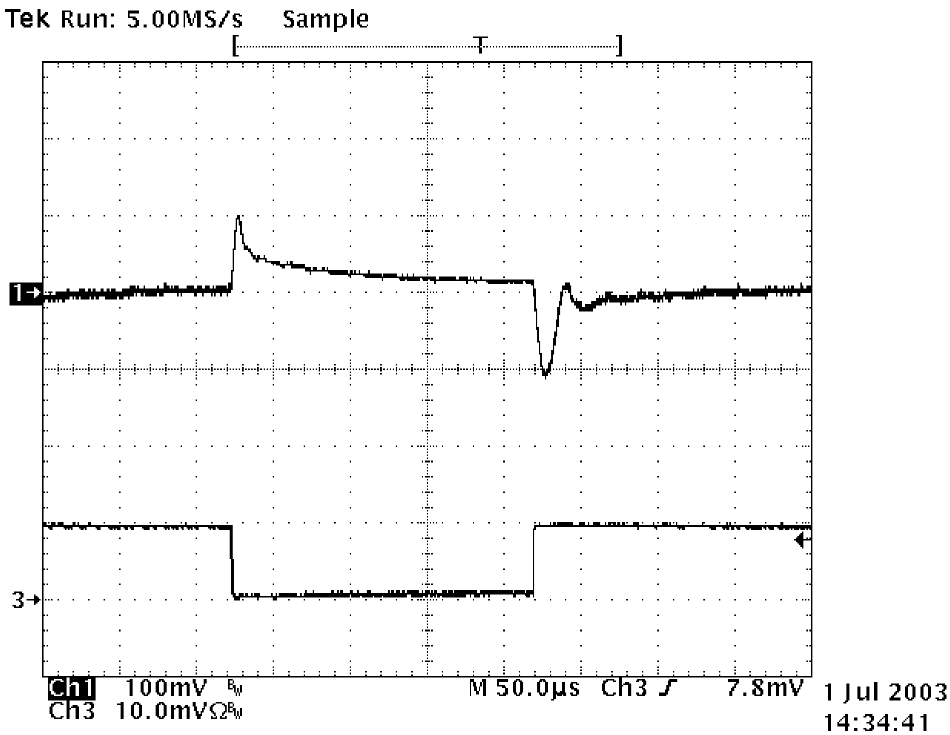
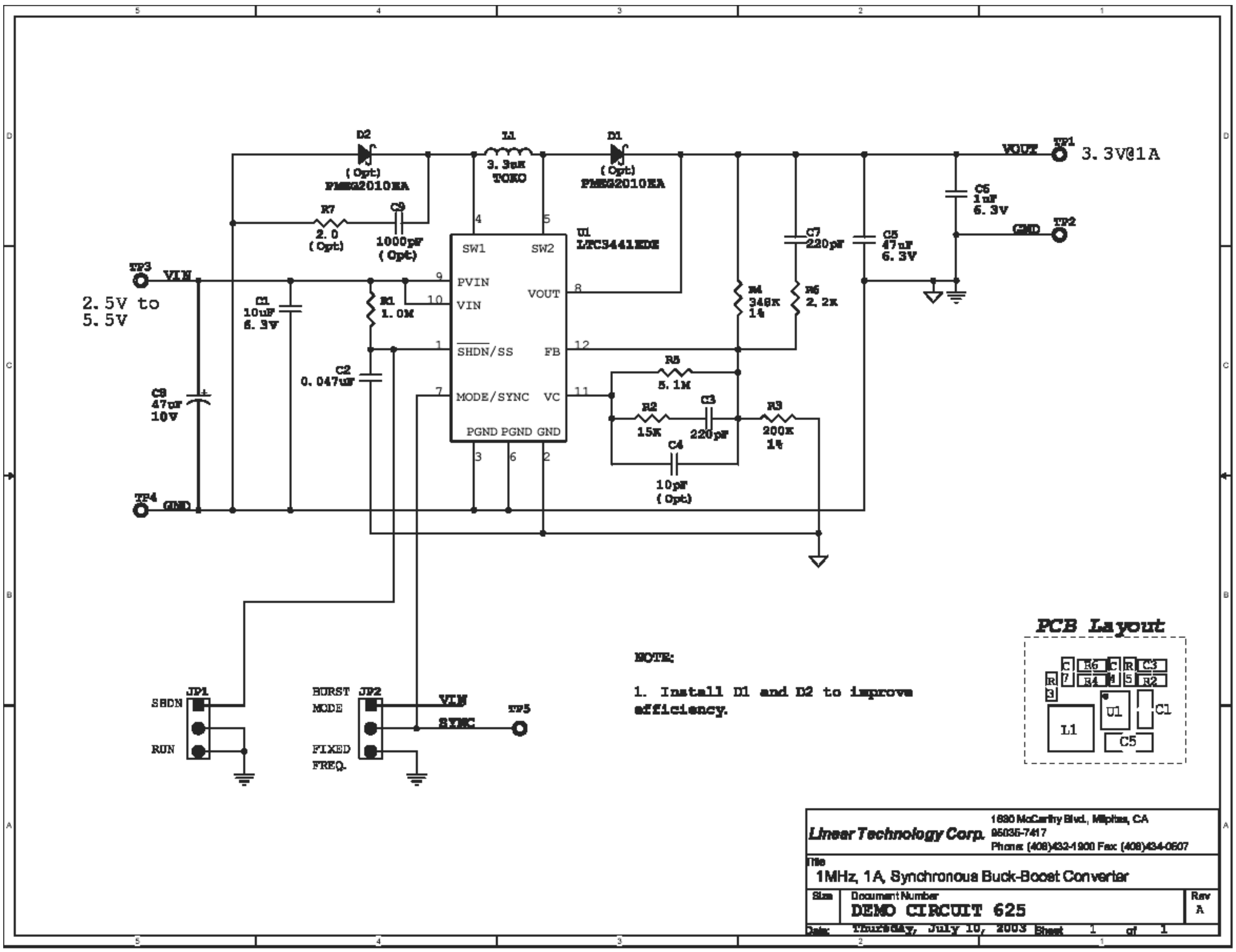
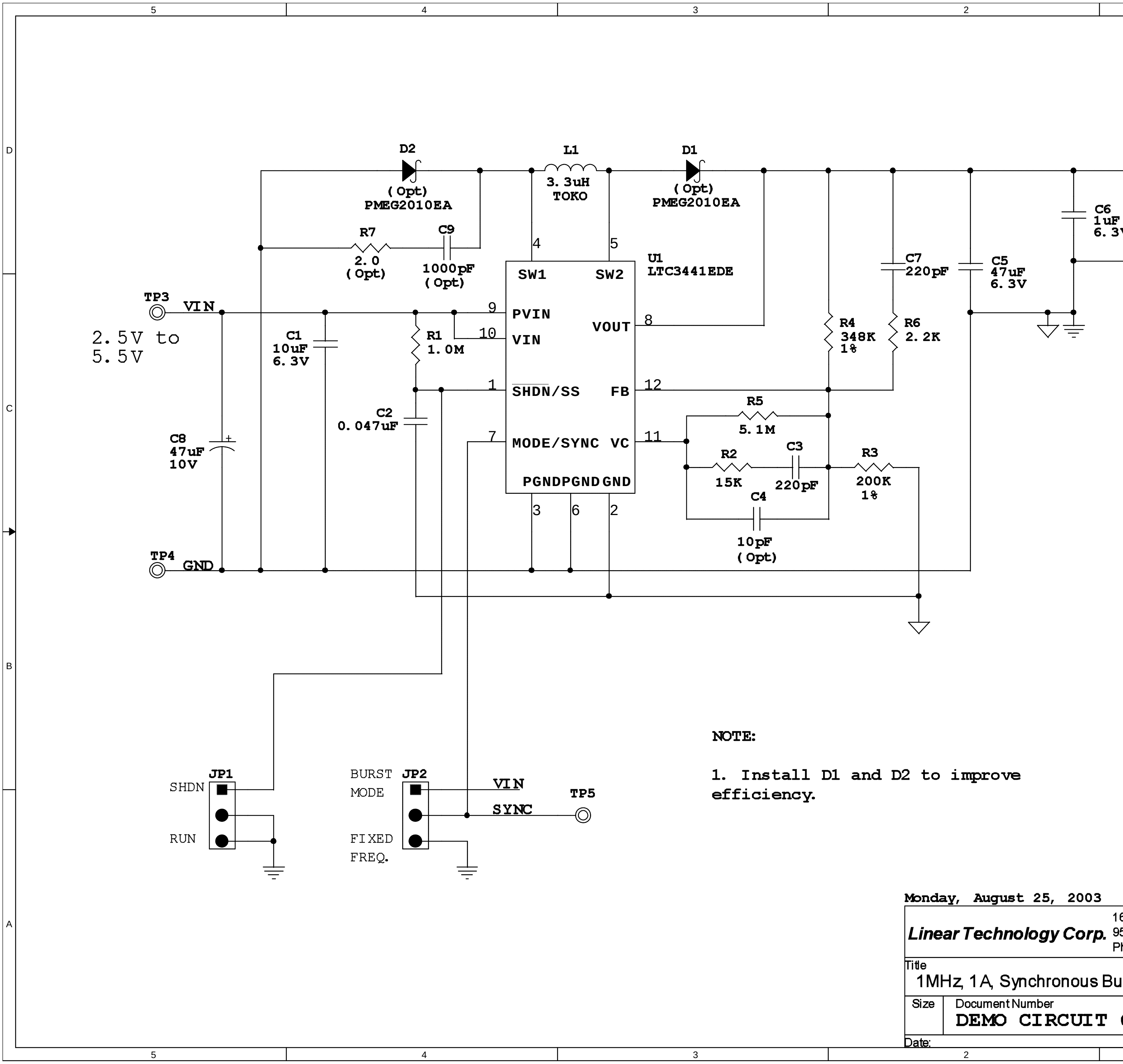


Figure 4. Load Transient Response (Vin=3V;Channel 1: Vout; Channel 2: Iout: load step from 100mA to 1A)


D2
(Opt)
PMEG2010EA
L1
3.3uH
TOKO
D1
(Opt)
PMEG2010EA
VOUT
TP1
3.3V@1A
C6
1uF
6.3V
TP2
GND
R7
2.0
(Opt)
C9
1000pF
(Opt)
U1
LTC3441EDE
SW1
SW2
TP3
VIN
2.5V to
5.5V
C1
10uF
6.3V
R1
1.0M
PVIN
VIN
VOUT
SHDN/SS
FB
MODE/SYNC
VC
PGND PGND GND
C7
220pF
C5
47uF
6.3V
R4
340K
1%
R6
2.2K
R5
5.1M
C2
0.047uF
C8
47uF
10V
R2
15K
C3
220pF
R3
200K
1%
C4
10pF
(Opt)
TP4
GND
JP1
SHDN
RUN
BURST
MODE
JP2
FIXED
FREQ.
VIN
SYNC
TP5
NOTE:
1. Install D1 and D2 to improve efficiency.
PCB Layout
L1
U1
C1
C5
Linear Technology Corp.
1630 McCarthy Blvd, Milpitas, CA
95035-7417
Phone: (408)432-1900 Fax: (408)434-0507
Title
1MHz, 1A, Synchronous Buck-Boost Converter
Size
Document Number
DEMO CIRCUIT 625
Rev
A
Date:
Thursday, July 10, 2003
Sheet 1 of 1

Item	Qty	Reference	Part Description	Manufacture / Part #
1	1	C1	Cap., X5R 10uF 6.3V 20%	Taiyo Yuden JMK212BJ106MG-T
2	1	C2	Cap., X5R 0.047uF 16V 5%	AVX 0402YD473JAT
3	2	C3,C7	Cap., NPO 220pF 25V 10%	AVX 04023A221KAT2A
4	0	C4 (Opt)	Cap., NPO 10pF 25V 10%	AVX 04023A100KAT2A
5	1	C5	Cap., X5R 47uF 6.3V 20%	Taiyo Yuden JMK325BJ476MM-T
6	1	C6	Cap., X5R 1uF 6.3V 10%	Taiyo Yuden JMK107BJ105KA-T
7	1	C8	Cap., Tant. 47uF 10V 20%	AVX TAJB476M010
8	0	C9 (Opt)	Cap., X7R 1000pF 25V 20%	AVX 04023C102MAT2A
9	2	D2,D1	Schottky Diode, 1A / 20V	PHILIPS PMEG2010EA
10	2	JP1,JP2	Headers, 3 Pins 2mm Ctrs.	CommConn Con Inc. 2802S-03G2
11	2	XJP1,XJP2	Shunt, 2 Pins 2mm Ctrs.	CommConn Con Inc. CCIJ2MM-138G
12	1	L1	Inductor, 3.3uH	TOKO A916CY-3R3M
13	1	R1	Res., Chip 1.0M 1/16W 5%	AAC CR05-105JM
14	1	R2	Res., Chip 15K 1/16W 5%	AAC CR05-153JM
15	1	R3	Res., Chip 200K 0.06W 1%	AAC CR05-2003FM
16	1	R4	Res., Chip 348K 1/16W 1%	AAC CR05-3483FM
17	1	R5	Res., Chip 5.1M 1/16W 5%	AAC CR05-515JM
18	1	R6	Res., Chip 2.2K 0.06W 5%	AAC CR05-222JM
19	0	R7 (Opt)	Res., Chip 2.0 0.06W 1%	AAC CR05-2R00FM
20	5	TP1,TP2,TP3,TP4,TP5	Turret, Testpoint	Mill Max 2501-2
21	1	U1	I.C., Buck Converter	Linear Tech. Corp. LTC3441EDE
22	4		SCREW, #4-40, 1/4"	ANY
23	4		STANDOFF, #4-40 1/4"	MICRO PLASTICS 14HTSP101
24	1		PRINTED CIRCUIT BOARD	FAB., DEMO CIRCUIT 625A
25	2		TOP STENCIL	STENCIL DC625A



5
4
3
2
D
C
B
A
D2
(Opt)
PMEG2010EA
L1
3.3uH
TOKO
D1
(Opt)
PMEG2010EA
R7
2.0
(Opt)
C9
1000pF
(Opt)
C6
1uF
6.3V
U1
LTC3441EDE
C7
220pF
C5
47uF
6.3V
TP3
VIN
2.5V to
5.5V
C1
10uF
6.3V
R1
1.0M
SW1
SW2
PVIN
VIN
VOUT
SHDN/SS
FB
MODE/SYNC
VC
PGND
PGND
GND
R4
348K
1%
R6
2.2K
R5
5.1M
R2
15K
C3
220pF
R3
200K
1%
C4
10pF
(Opt)
C2
0.047uF
C8
47uF
10V
TP4
GND
JP1
SHDN
RUN
BURST
MODE
JP2
FIXED
FREQ.
VIN
SYNC
TP5
NOTE:
1. Install D1 and D2 to improve efficiency.
Monday, August 25, 2003
Linear Technology Corp.
Title
1MHz, 1A, Synchronous Bu
Size
Document Number
DEMO CIRCUIT
Date:

Linear Technology Corporation

LTC3441EDE

Bill Of Material
Demo Bd. #625A

6/17/2005

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