

LT3690: 36V/4A μ Power Synchronous Buck Regulator

DESCRIPTION

Demonstration circuit 1520A is a 36V, 4A synchronous Buck Regulator with 70 μ A Quiescent Current featuring the LT3690. The demo board is designed for 3.3V output from a 4.5V to 36V input with transient up to 60V. The wide input range of the LT3690 allows a variety of input sources, such as automotive batteries and industrial supplies. The switching frequency can be programmed either via oscillator resistor or external clock over a 170kHz to 1.5MHz range. When the circuit is synchronized to an external clock connected to the SYNC terminal, the RT resistor (R5) should be chosen to set the LT3690 internal switching frequency at least 20% below the lowest synchronization input frequency. The modes of operation (fixed frequency and Burst Mode[®]) are jumper selectable. The Burst Mode operation increases the efficiency at light loads while fixed frequency mode maintains a constant switching frequency regardless of the load current.

The current mode control scheme creates fast transient response and good loop stability. The driver of the internal HS switch is boosted to a voltage that is higher than the V_{IN} to ensure saturation of the switch. The LT3690's integrated boost diode and switches reduce the part count. Meanwhile, the internal synchronous power switch increases efficiency and eliminates the need for an external Schottky catch diode. The EN pin can be used to set the part in micro power shutdown mode, reducing the supply current to less than 1 μ A.

The LT3690 datasheet gives a complete description of the part, operation and application information. The data sheet

must be read in conjunction with this demo manual for demo circuit 1520A. The LT3690 is assembled in a 26-lead plastic UFE package with two thermally enhanced pads for SW and GND. Proper board layout is essential for both proper operation and maximum thermal performance. See the data sheet section PCB Layout and High Temperature Considerations.

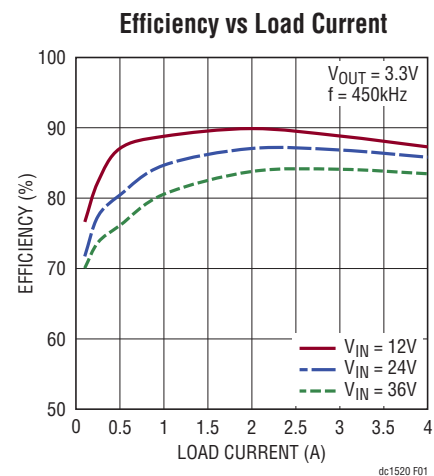


Figure 1. DC1520A Efficiency

Design files for this circuit board are available at <http://www.linear.com/demo>

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PERFORMANCE SUMMARY ($T_A = 25^\circ C$)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Minimum Input Supply Voltage			4.5		V
Maximum Input Supply Voltage			36		V
Output Voltage V_{OUT}			3.3		V
Maximum Output Current			4		A
Switching Frequency	$R_T = 45.3k$		450		kHz

dc1520af

QUICK START PROCEDURE

Demonstration circuit 1520A is easy to set up and evaluate the performance of the LT3690. Refer to Figure 2 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 V_{IN} or V_{OUT} and GND terminals.

1. Place jumpers in the following positions:

JP1: EN

JP2: Burst Mode

2. With power off, connect the input power supply to V_{IN} and GND.

3. Connect a load of 4A or less to V_{OUT} and GND terminals.

4. Turn on the power at the input.

NOTE. Make sure that the input voltage does not exceed 36V.

5. Check for the proper output voltage (3.3V).

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

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

7. An external clock can be added to the SYNC terminal when SYNC function is used (JP2 open). Please make sure that the SYNC frequency is at least 20% higher than the set switching frequency. See the data sheet section Synchronization.

QUICK START PROCEDURE

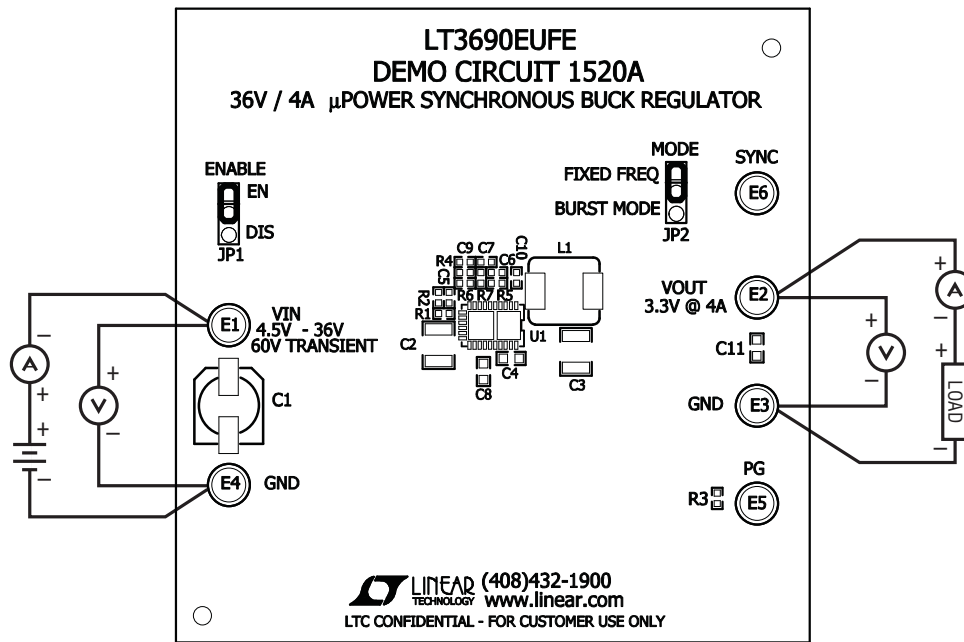


Figure 2. Proper Measurement Equipment Setup

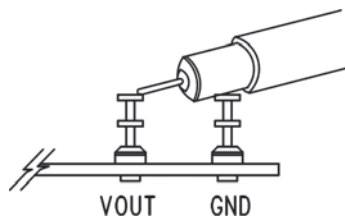


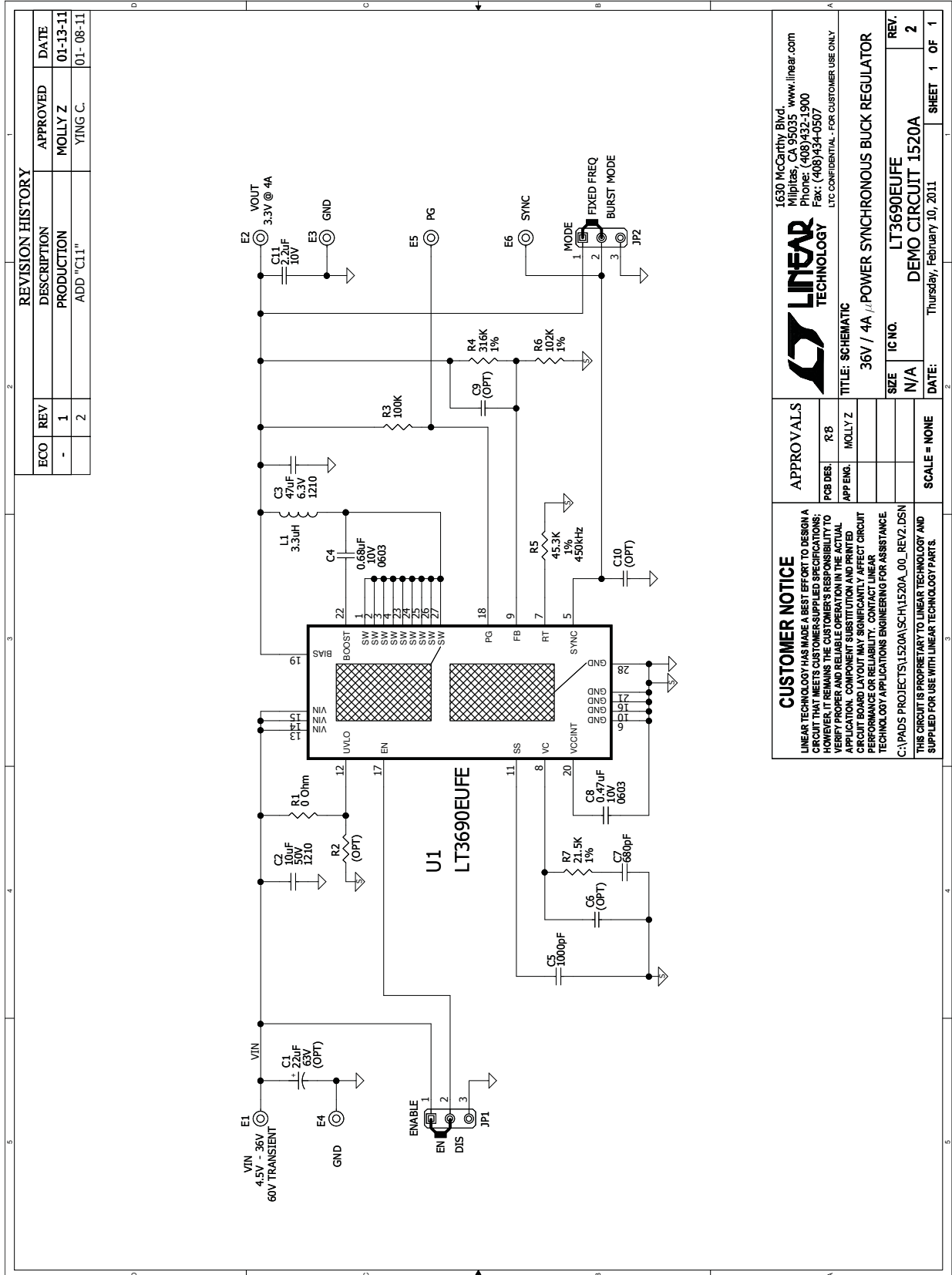
Figure 3. Measuring Input or Output Ripple

DEMO MANUAL DC1520A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C2	Capacitor, X5R, 10 μ F, 50V, 20%, 1210	Taiyo Yuden, UMK325BJ106MM-T
2	1	C3	Capacitor, X5R, 47 μ F, 6.3V, 20%, 1210	Taiyo Yuden, JMK325BJ476MM-T
3	1	C4	Capacitor, X5R, 0.68 μ F, 10V, 10%, 0603	Taiyo Yuden, LMK107BJ684KA-T
4	1	C5	Capacitor, X7R, 1000pF, 25V, 20%, 0402	AVX, 04023C102MAT2A
5	1	C7	Capacitor, X7R, 680pF, 25V, 10%, 0402	AVX, 04023C681KAT2A
6	1	C8	Capacitor, X5R, 0.47 μ F, 10V, 10%, 0603	Taiyo Yuden, LMK107BJ474KA-T
7	1	C11	Capacitor, X5R, 2.2 μ F, 10V, 20%, 0603	Taiyo Yuden, LMK107BJ225MA-T
8	1	L1	Inductor, 3.3 μ H, IHLP-2525EZ-01 (SERIES)	Vishay, IHLP2525EZER3R3M01
9	1	R1	Resistor/Jumper, Chip, 0 Ω , 1/16W, 1A, 0402	Vishay, CRCW04020000Z0EA
10	1	R3	Resistor, Chip, 100k, 0.06W, 5%, 0402	Vishay, CRCW0402100KJNED
11	1	R4	Resistor, Chip, 316k, 0.06W, 1%, 0402	Vishay, CRCW0402316KFKED
12	1	R5	Resistor, Chip, 45.3k, 0.06W, 1%, 0402	Vishay, CRCW040245K3FKED
13	1	R6	Resistor, Chip, 102k, 0.06W, 1%, 0402	Vishay, CRCW0402102KFKED
14	1	R7	Resistor, Chip, 21.5k, 0.06W, 1%, 0402	Vishay, CRCW040221K5FKED
15	1	U1	IC, Buck Regulator, QFN(26) (UFEMA) 4mm \times 6mm	Linear Technology, LT3690EUFE
Additional Circuits				
16	0	C1 (OPT)	Capacitor, Alum 22 μ F, 63V, 25%, OSCON-CE-6.3	Sanyo, 63CE22BS
17	0	C6, C9, C10 (OPT)	Capacitor, 0402	
18	0	R2 (OPT)	Resistor, 0402	
Hardware/Components (For Demo Board Only)				
19	6	E1-E6	Turret, Testpoint 0.094"	Mill Max, 2501-2-00-80-00-00-07-0
20	2	JP1, JP2	Header, 3-Pin, 0.079 Single Row	Samtec, TMM-103-02-L-S
21	2	XJP1, XJP2	Shunt, 2mm Ctrs.	Samtec, 2SN-BK-G

SCHEMATIC DIAGRAM



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LINEAR TECHNOLOGY

TITLE: SCHEMATIC
36V / 4A, μ P POWER SYNCHRONOUS BUCK REGULATOR

APPROVALS	IC NO.	REV.
POB DES. R/B	N/A	LT3690EUFE 2
APP ENG. MOLLY Z	SIZE	DEMO CIRCUIT 1520A
	SCALE = NONE	DATE: Thursday, February 10, 2011
		SHEET 1 OF 1

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C:\PADS PROJECTS\1520A\SCH\1520A_00_REV2.DSN
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.



DEMO MANUAL DC1520A

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