

LT3724

High Voltage Current Mode Step-Down Converter

DESCRIPTION

Demonstration Circuit 736A is a 200kHz high voltage, current-mode DC/DC step-down converter featuring the [LT[®]3724](#).

The circuit operates from a V_{IN} range of 30V to 55V and outputs 24V at 3A (72W). A soft-start feature controls the output voltage slew rate at start-up, reducing current surges and voltage overshoots. Burst Mode[®] operation that improves the efficiency at light loads can be enabled with a jumper.

An optional boost bias circuit is provided on the bottom side of the board for back-driving the LT3724 internal regulator from the output voltage. Customers might want to use this optional circuit with modified applications that have relatively high input voltages and low (~5V) output voltages. In such applications, the optional circuit can increase the overall efficiency by reducing the power lost

in the LT3724. The demonstration circuit has also been laid out with the option for a second switching MOSFET to facilitate higher output currents. The circuit design can be modified for a boost converter configuration.

This circuit is suitable for a wide range of Industrial control systems and particularly suitable for 12V/42V automotive applications and 48V Telecom power supplies.

The LT3724 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this demo manual.

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

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PERFORMANCE SUMMARY Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		30		55	V
Efficiency	$V_{IN} = 30\text{V}, I_{OUT} = 3.0\text{A}$		97.4		%
	$V_{IN} = 48\text{V}, I_{OUT} = 3.0\text{A}$		95.4		%
	$V_{IN} = 55\text{V}, I_{OUT} = 3.0\text{A}$		94.7		%
Switching Frequency			200		kHz
Output Voltage	$I_{OUT} = 0\text{A to } 3.0\text{A}$		24		V
Output Voltage Ripple	$V_{IN} = 48\text{V}, I_{OUT} = 3.0\text{A}$		100		mV

QUICK START PROCEDURE

DC736A is easy to set up to evaluate the performance of the LT3724. 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. See Figure 2 for the proper scope technique.

1. Place JP1 in the RUN position.
2. Place JP2 in the desired operating mode: fixed frequency or Burst Mode operation.
3. With power off, connect the input power supply to V_{IN} and GND.
4. With power off, connect the load to V_{OUT} and GND.

5. Turn on the power at the input and adjust the input voltage until the LT3724 turns on.

NOTE: Make sure that the input voltage does not exceed 55V.

6. Check for the proper output voltage.

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

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

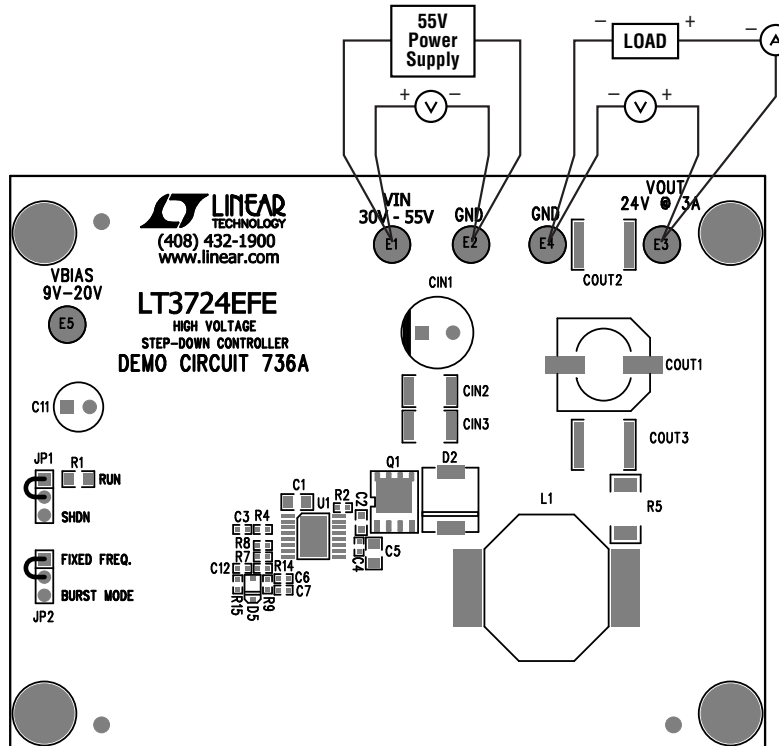


Figure 1. Proper Measurement Equipment Setup

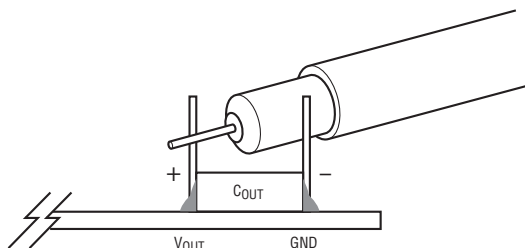


Figure 2. Measuring Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	CIN1	Cap., Aluminum 68μF 63V 20%	Sanyo 63MV68AX-T
2	2	CIN2, CIN3	Cap., X7R 2.2μF 100V 20%	TDK C4532X7R2A225M
3	1	COUT1	Cap., Alum 330μF 35V 10%	Sanyo 35CV330AX-T
4	2	COUT3, COUT2	Cap., X7R 22μF 25V 20%	TDK C5750X7R1E226M
5	1	C1	Cap., NPO 1000pF 100V 10%	AVX 08051A102KAT1A
6	1	C2	Cap., X5R 0.22μF 16V 10%	Taiyo Yuden EMK107BJ224KA
7	1	C3	Cap., X7R 1000pF 25V 10%	AVX 04023C102KAT2A
8	1	C4	Cap., X5R 0.1μF 16V 10%	AVX 0402YD104KAT2A
9	1	C5	Cap., X5R 1μF 16V 10%	Taiyo Yuden EMK212BJ105KG
10	1	C6	Cap., X7R 120pF 25V 10%	AVX 04023C121KAT2A
11	1	C7	Cap., X7R 1500pF 16V 20% 0402	AVX 0402YC152MAT2A
12	1	C12	Cap., X7R 0.01μF 16V 10%	AVX 0402YC103KAT2A
13	1	D1	Diode, Speed Switching	Diodes Inc. BAS19
14	1	D2	Schottky Diode 60V	IR 30BQ060
15	1	D5	Diode, 75V/200mW	Diodes Inc. 1N4148WS
16	1	L1	Inductor, 47μH	Coilcraft DO5040H-473MLB
17	1	Q1	MOSFET N-Channel, PowerPak SO8	Vishay Siliconix Si7852DP
18	1	R1	Res, Chip 1M 0.1W 5%	AAC CR10-105JM
19	1	R2	Res/Jumper, Chip 0Ω 0.06W 1A	AAC CJ05-000M
20	1	R3	Res., Chip 52.3k 1/16W 1%	Vishay CRCW0402 52.3K 1%
21	1	R4	Res., Chip 402K 1/16W 1%	AAC CR05-4023FM
22	1	R5	Res., 0.025 0.5W 1%	IRC LRF2010-01-R025-F
23	1	R6	Res., Chip 1M 0.1W 5%	AAC CR16-105JM
24	1	R7	Res., Chip 4.99k 0.06W 1%	AAC CR05-4991FM
25	1	R8	Res., Chip 93.1k 1/16W 1%	AAC CR05-9312FM
26	1	R9	Res., Chip 2.21k 1/16W 1%	AAC CR05-2211FM
27	1	R14	Res., Chip 470 1/16W 5%	AAC CR05-471JM
28	1	R15	Res., Chip 47k 1/16W 5%	AAC CR05-473JM
29	1	U1	I.C., Voltage Regulator	Linear Technology Corporation LT3724EFE

Additional Demo Board Circuit Components

1	0	C8	Cap., X5R C-4.7μF, 6.3V-0805 6.3V 20%	Taiyo Yuden JMK212BJ475MG-T
2	0	C9	Cap., X5R 1μF 16V 20%	Taiyo Yuden EMK212BJ105MG
3	0	C10	Cap., NPO 220pF 25V 10%	AVX 04023A221KAT2A
4	0	C11	Cap., Aluminum 22μF 35V 10%	Sanyo 35MV22UAX
5	0	D3,D4	Schottky Diode, 40V	Zetex ZHCS400
6	0	L2	Inductor, L-10μH	Murata LQH3C100M24
7	0	R10	Res./Jumper, Chip 0Ω 0.06W 1A	AAC CJ05- 000M
8	0	R11	Res., Chip 107k 0.06W 1%	AAC CR05-1073FM
9	0	R12	Res., Chip 10k 0.06W 5%	AAC CR05-103JM
10	0	R13	Res., Chip 12.4k 1/16W 1%	AAC CR05-1242FM
11	0	U2	I.C., Voltage Regulator	Linear Technology Corporation LT1613CS5

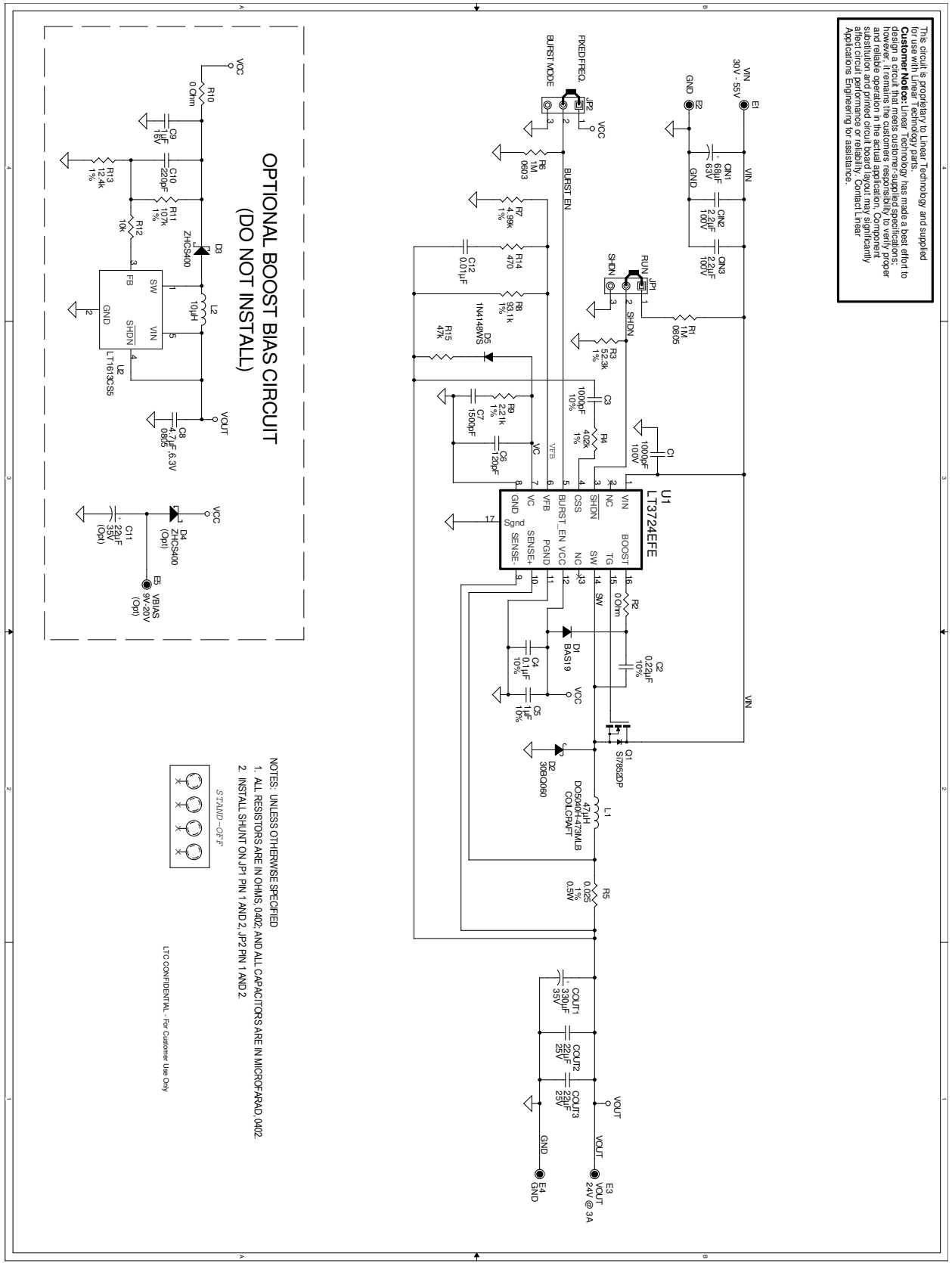
DEMO MANUAL DC736A

PARTS LIST

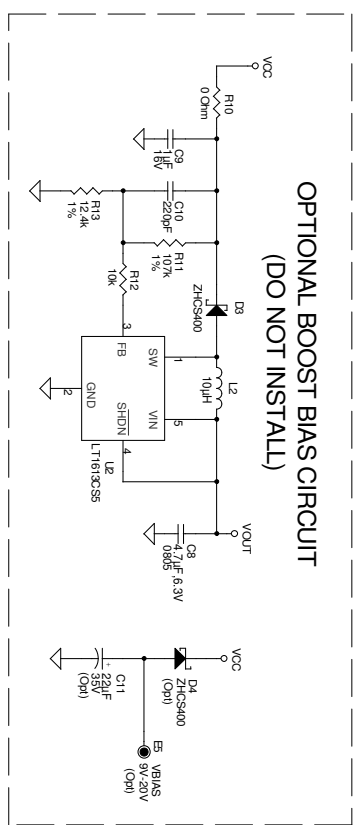
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Hardware – For Demo Board Only				
1	4	E1, E2, E3, E4	Testpoint, Turret	Mill Max 2501-2
2	0	E5	Testpoint, Turret	Mill Max 2501-2
3	2	JP2, JP1	Headers, 3 Pins 2mm Ctrs.	Comm Con Connectors 2802S-03G2
4	2	XJP1, XJP2	JMP, 3 Pin 1 Row .079CC	Comm Con Connectors CCIJ2MM-138GW

SCHEMATIC DIAGRAM

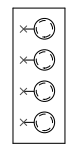
This circuit is proprietary to Linear Technology and supplied for use with Linear Technology products. **Customer Notice:** Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customer's responsibility to verify proper operation of the circuit. Linear Technology does not warrant, substitute, or modify the circuit for any application. Any substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.



**OPTIONAL BOOST BIAS CIRCUIT
(DO NOT INSTALL)**



- NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 0402, AND ALL CAPACITORS ARE IN MICROFARAD, 0402
 2. INSTALL SHUNT ON JP1 PIN 1 AND 2, JP2 PIN 1 AND 2.



LTC CONFIDENTIAL - For Customer Use Only

DEMO MANUAL DC736A

DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

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Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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