

LT3748

100V Isolated Flyback Converter

DESCRIPTION

Demonstration circuit 1694B is an isolated flyback converter featuring the LT[®]3748. The demo circuit is designed for a 12V output from a 22V to 75V DC input. The output current is up to 2.5A. The part senses the isolated output voltage directly from the primary side flyback waveform during the off time of the power switch. No third winding, opto-coupler, or signal transformer is required for regulation. A minimum load of approximately 2% of maximum load is required on the output to maintain regulation.

The demo circuit can be easily modified for applications of different input, and output voltage/current, with some pre-designed transformers from vendors such as Würth Electronics, Sumida, Pulse Engineering and Coilcraft. Both EP13 and EFD20 core transformers can be assembled on the board. A two-stage filter is optional for applications requiring very small output ripple.

The LT3748 is a high input voltage isolated flyback controller operating with input supply voltages from 5V to 100V, and 1.9A average gate drive source and sink current. The LT3748 utilizes boundary mode operation to provide a high efficiency, small size solution with improved load regulation of $\pm 5\%$ over the full line, load and temperature ranges. The LT3748 can be used in a wide variety of industrial, automotive, medical, telecom, data-com applications, where regulated isolated output is required.

The LT3748 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for Demo Circuit 1694B.

Design files for this circuit board are available at <http://www.linear.com/demo/DC1694B>

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PERFORMANCE SUMMARY

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

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		22	48	75	V
Output Voltage	$V_{IN} = 22\text{V to } 75\text{V}$ $I_{OUT} = 50\text{mA to } 2.5\text{A}$	11.4	12	12.6	V
Maximum Output Current	$V_{IN} = 22\text{V to } 75\text{V}$	2.5			A
Output Voltage Ripple (Peak-to-Peak)	$V_{IN} = 22\text{V to } 75\text{V}, I_{OUT} = 2.5\text{A}$			420	mV
Switching Frequency	$V_{IN} = 48\text{V}, I_{OUT} = 2.5\text{A}$		289		kHz
Efficiency	$V_{IN} = 48\text{V}, I_{OUT} = 2.5\text{A}$		86.5		%

QUICK START PROCEDURE

Demo circuit 1694B is easy to set up to evaluate the performance of the LT3748. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to VIN and GND.
2. Connect the load to the terminals VOUT+ and VOUT– on the board. Apply a load between 100mA to 2.5A to the output.
3. Turn on the power at the input. Increase VIN to 22V.

NOTE: Make sure that the input voltage does not exceed 75V.

4. Check for the proper output voltages. The output should be regulated at 12V ($\pm 5\%$).

NOTE: If there is no output, temporarily disconnect the power supply. Make sure that the load is properly connected. If the output voltage is out of spec, make sure minimum load current is applied to the output, the load is not set too high, and the DC power supply does not hit the current limit.

NOTE: If higher operating voltage is required, power components with higher voltage ratings should be used.

NOTE: The LT3748 requires minimum load to maintain good regulation. A Zener diode D4 is placed between VOUT+ and VOUT– to clamp the output voltage to ~13V if minimum load requirement is not met. Depending on input voltage and output regulation, a 100mA minimum load is usually sufficient.

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

NOTE: When measuring the input or output voltage ripples, 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 and GND, or VOUT+ and VOUT– terminals. See Figure 2 for proper scope probe technique.

QUICK START PROCEDURE

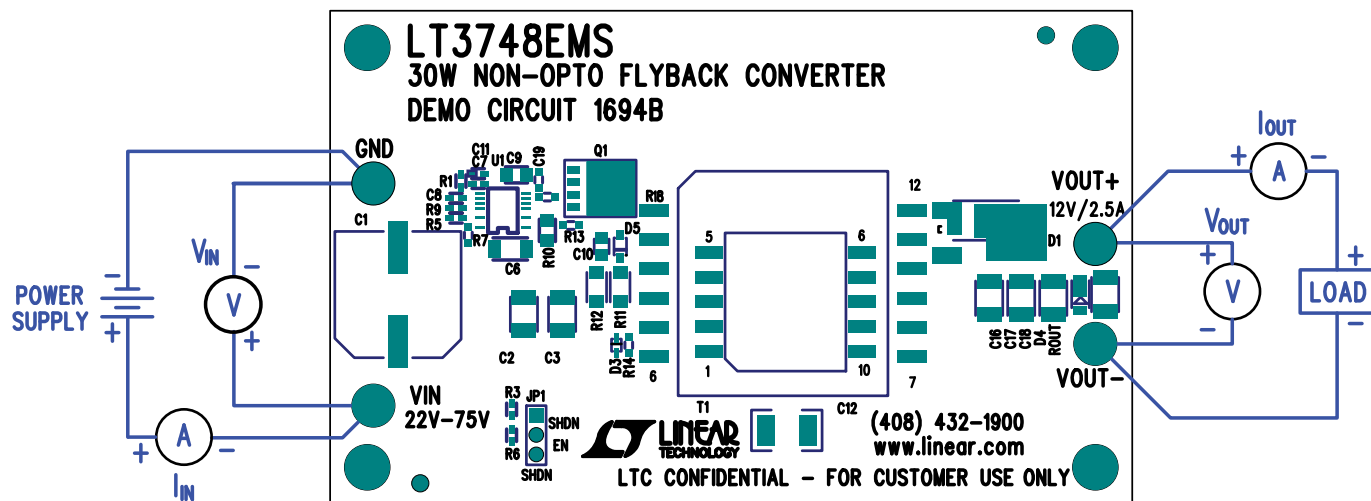


Figure 1. Proper Measurement Equipment Setup

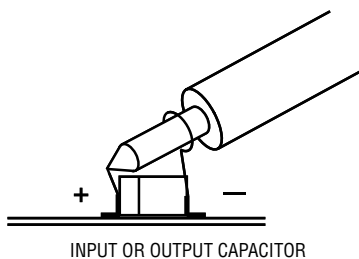


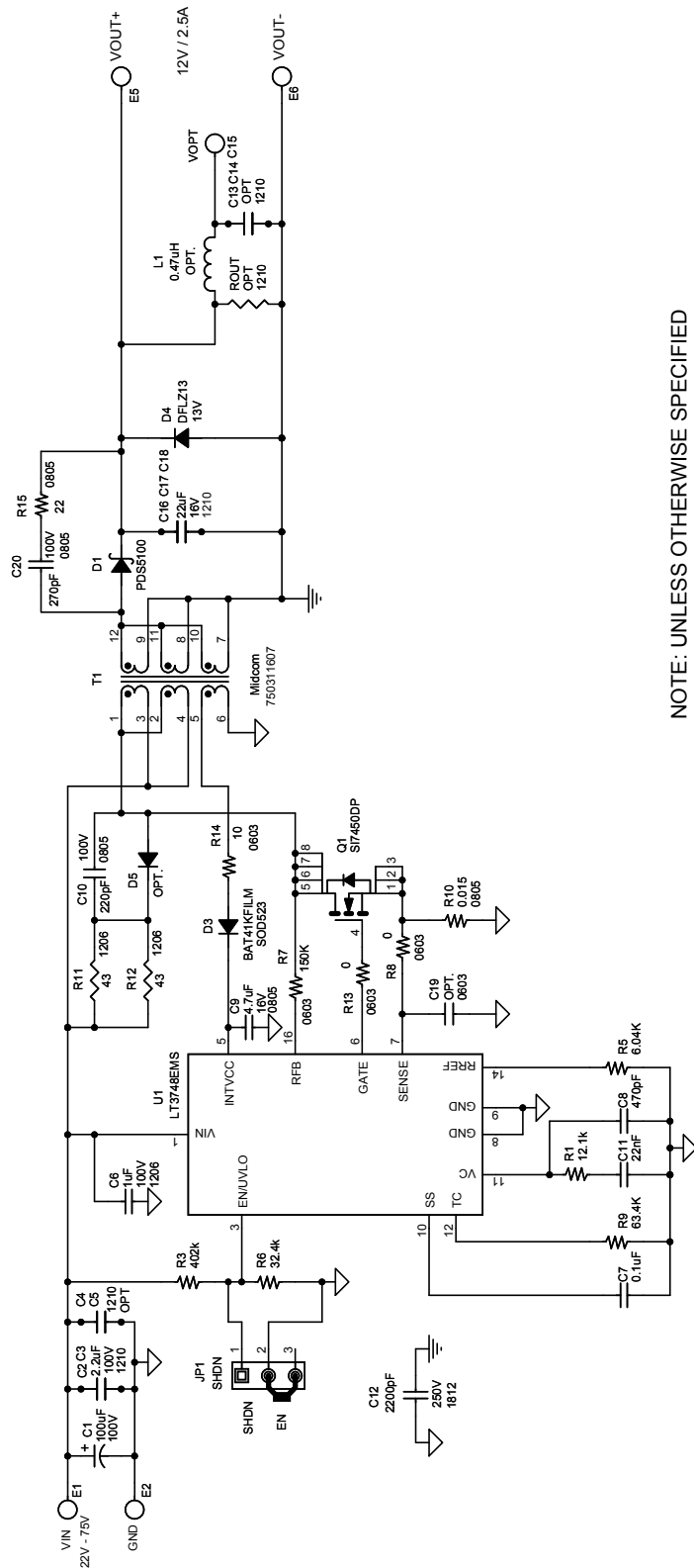
Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

DEMO MANUAL DC1694B

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART #
Required Circuit Components				
1	1	C1	CAP., ELECTRO., 100µF, 100V	CHEMI-CON, EMVY101ARA101MKE0S
2	2	C2, C3	CAP., X7R, 2.2µF, 100V, 20% 1210	TDK C3225X7R2A225M
3	1	C6	CAP., X7R, 1.0µF, 100V, 20% 1206	AVX, 12061C105MAT2A
4	1	C7	CAP., X7R, 0.1µF, 16V, 10% 0402	TDK, C1005X7R1C104K
5	1	C8	CAP., COG, 470pF, 50V, 5% 0402	TDK, C1005COG1H471J
6	1	C9	CAP., X5R, 4.7µF, 16V, 20% 0805	AVX, 0805YD475MAT2A
7	1	C10	CAP., COG, 220pF, 100V, 5% 0805	AVX, 08051A221JAT2A
8	1	C11	CAP., X7R, 22nF, 25V, 10% 0402	MURATA, GRM155R71E223KA61D
9	1	C12	CAP., X7R, 2200pF, 250V, 10% 1812	MURATA, GA343QR7GD222KW01L
10	3	C16, C17, C18	CAP., X7R, 22µF, 16V, 20% 1210	TDK, C3225X7R1C226M
11	1	C20	CAP., COG, 270pF, 100V, 5% 0805	MURATA, GRM2165C2A271JA01D
12	1	D1	DIODE., PDS5100, Power DI-5	DIODE INC., PDS5100-13
13	1	D3	Schottky Barrier Rec., BAT41, SOD523	ST, BAT41KFILM
14	1	D4	ZENER DIODE, DFLZ13, 13V, PowerDI-123	DIODE INC., DFLZ13-7
15	1	Q1	N-MOSFET, SI7450DP, PowerPAK	VISHAY, SI7450DP-T1-GE3
16	1	R1	RES., CHIP, 12.1k, 1% 0402	VISHAY, CRCW040212K1FKED
17	1	R3	RES., CHIP, 402k, 1% 0402	VISHAY, CRCW0402402KFKED
18	1	R5	RES., CHIP, 6.04k, 1% 0402	NIC, NRC04F6041TRF
19	1	R6	RES., CHIP, 32.4k, 1% 0402	VISHAY, CRCW040232K4FKED
20	1	R7	RES., CHIP, 150k, 1% 0603	VISHAY, CRCW0603150KFKED
21	2	R8, R13	RES., CHIP, 0, 1% 0603	VISHAY, CRCW06030000Z0EA
22	1	R9	RES., CHIP, 63.4k, 1% 0402	VISHAY, CRCW040263K4FKED
23	1	R10	RES., CHIP, 0.015Ω, 1/8W, 1% 0805	VISHAY, WSL0805R015F
24	2	R11, R12	RES., CHIP, 43Ω, 1/4W, 5% 1206	VISHAY, CRCW120643R0JNEA
25	1	R14	RES., CHIP, 10, 1% 0603	VISHAY, CRCW060310R0FKED
26	1	R15	RES., CHIP, 22, 1/8W, 5% 0805	VISHAY, CRCW080522R0JNEA
27	1	T1	TRANSFORMER	Midcom, Inc. 750311607
28	1	U1	I.C. LT3748EMS, MSOP-16	LINEAR TECH., LT3748EMS#TRPBF
Additional Demo Board Circuit Components				
1	0	C4, C5, C13, C14, C15 (OPT.)	CAP., 1210	
2	0	C19 (OPT.)	CAP., 0603	
3	0	D5 (OPT.)	Schottky Barrier Rec., SOD-323	
4	0	L1 (OPT.)	INDUCTOR	
5	0	ROUT (OPT.)	RES., 1210	
Hardware – For Demo Board Only				
1	4	E1, E2, E5, E6	TESTPOINT, TURRET, .094" pbf	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	3 PIN 0.079 SINGLE ROW HEADER	SAMTEC, TMM103-02-L-S
3	1	XJP1	SHUNT, .079" CENTER	SAMTEC, 2SN-BK-G
4	4	MTG 4 CORNERS	STAND-OFF, NYLON (SNAP ON), 0.25" TALL	KEYSTONE, 8831

SCHEMATIC DIAGRAM



NOTE: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTORS ARE 0402.
 ALL CAPACITORS ARE 0402.

Figure 3. DC1694B Demo Circuit Schematic

DEMO MANUAL DC1694B

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

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