LT8303 Micropower No-Opto Isolated Flyback Converter

DESCRIPTION

Demonstration circuit 2490A is a micropower no-opto isolated flyback converter featuring the LT®8303. This demo circuit outputs 5V, and maintains tight regulation with a load current from 2.5mA to 0.84A over an input voltage from 36V to 72V. The output current capability increases with the input voltage, as shown in the Performance Summary table.

The DC2490A needs less than 0.5% of its full output power as a minimum load to maintain good output voltage regulation. On the DC2490A, in order to avoid preloading, a 5.6V Zener diode is placed between its V_{OUT}^+ and V_{OUT}^- to serve as a minimum load.

The Performance Summary table summarizes the performance of the demo board at room temperature. The demo circuit can be easily modified for different applications with some predesigned transformers.

The LT8303 is a micropower high voltage isolated flyback converter. By sampling the isolated output voltage directly from the primary-side flyback waveform, the part requires no third winding or opto-isolator for regulation. The output voltage is programmed with a single external resistor. Boundary mode operation provides a small magnetic solution with excellent load regulation. Low ripple Burst Mode® operation maintains high efficiency at light load while minimizing the output voltage ripple. A 0.45A, 150V DMOS power switch is integrated along with all the high voltage circuitry and control logic into a 5-lead ThinSOT™ package.

The LT8303 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 2490A.

Design files for this circuit board are available at http://www.linear.com/demo/DC2490A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage		36	48	72	V
Output Voltage	I_{OUT} = 2.5mA to 0.65A	4.75	5	5.25	V
Maximum Output Current	V_{IN} = 36V	0.65			A
	V_{IN} = 48V	0.73			A
	V_{IN} = 72V	0.84			A
Output Voltage Ripple (Peak to Peak)	V_{IN} = 48V, I_{OUT} = 0.73A		50		mV
Typical Switching Frequency	V_{IN} = 48V, I_{OUT} = 0.73A		260		kHz
Efficiency	V_{IN} = 36V, I_{OUT} = 0.65A		86		%
	V_{IN} = 48V, I_{OUT} = 0.73A		86		%
	V_{IN} = 72V, I_{OUT} = 0.84A		85		%

QUICK START PROCEDURE

Demonstration circuit 2490A is easy to set up to evaluate the performance of the LT8303. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to the board through V_{IN} (E1) and GND (E2) terminals. Connect the load to the terminals V_{OUT}^+ (E3) and V_{OUT}^- (E4) on the board.

2. Turn on the power at the input. Increase V_{IN} slowly to 36V.

   NOTE: Make sure that the input voltage is always within spec. To operate the board with higher input/output voltage, input capacitor, output capacitor and output diode with higher voltage ratings are needed.

3. Check for the proper output voltages. The output should be regulated at 5V (±5%).

   NOTE: The LT8303 requires very small minimum load to maintain good output voltage regulation. A Zener diode is placed on the output to clamp the voltage to 5.6V. This Zener can be replaced with a 2000Ω resistor at the trade-off of lower efficiency.

4. Once the proper output voltage is established, adjust the input voltage and load current 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 V_{IN} (E1) and GND (E2), or V_{OUT}^+ (E3) and V_{OUT}^- (E4) terminals. See Figure 2 for proper scope probe technique.

QUICK START PROCEDURE

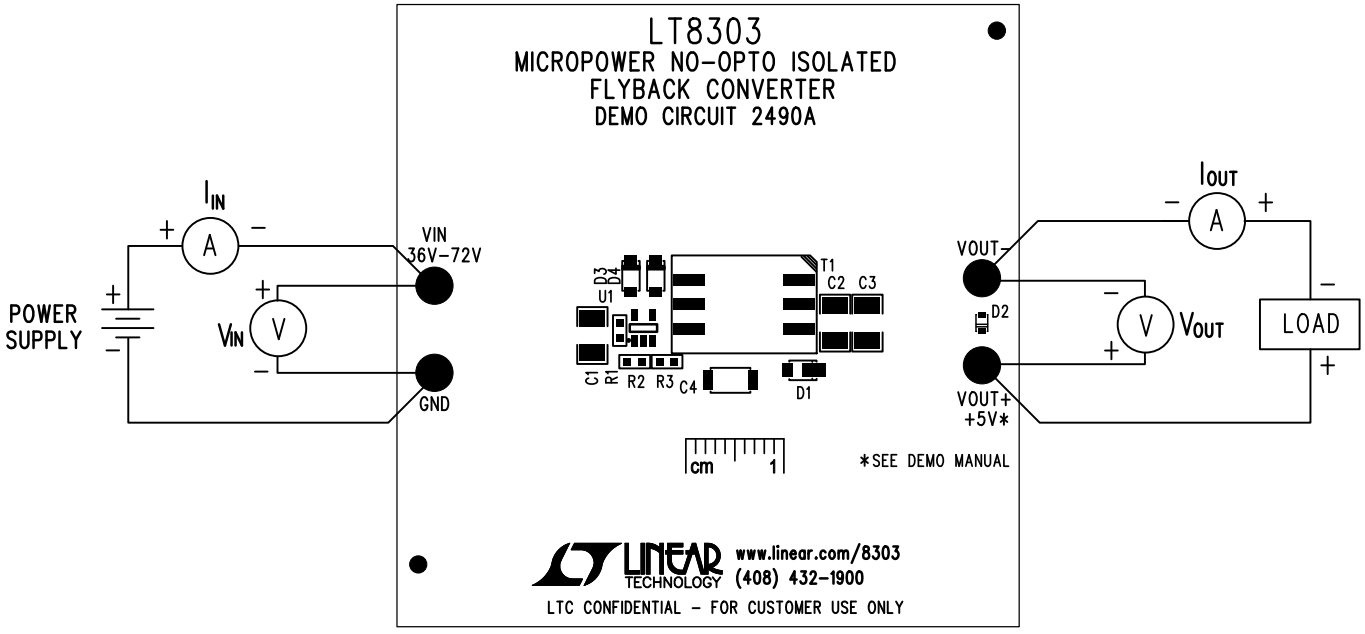


Figure 1. Proper Measurement Equipment Setup

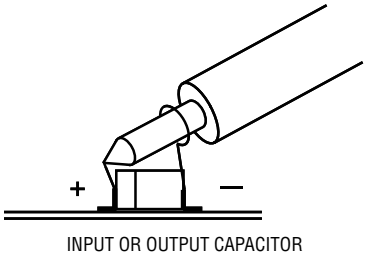


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

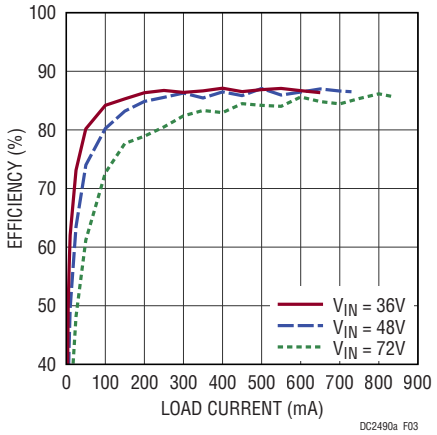


Figure 3. Efficiency vs Load Current

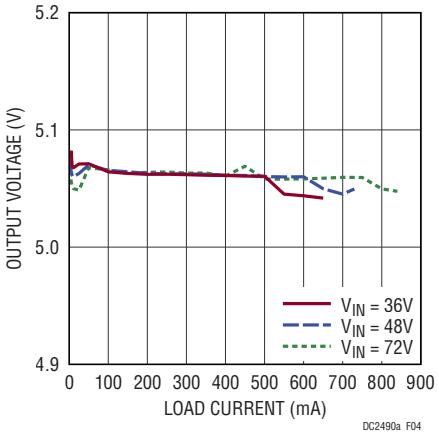
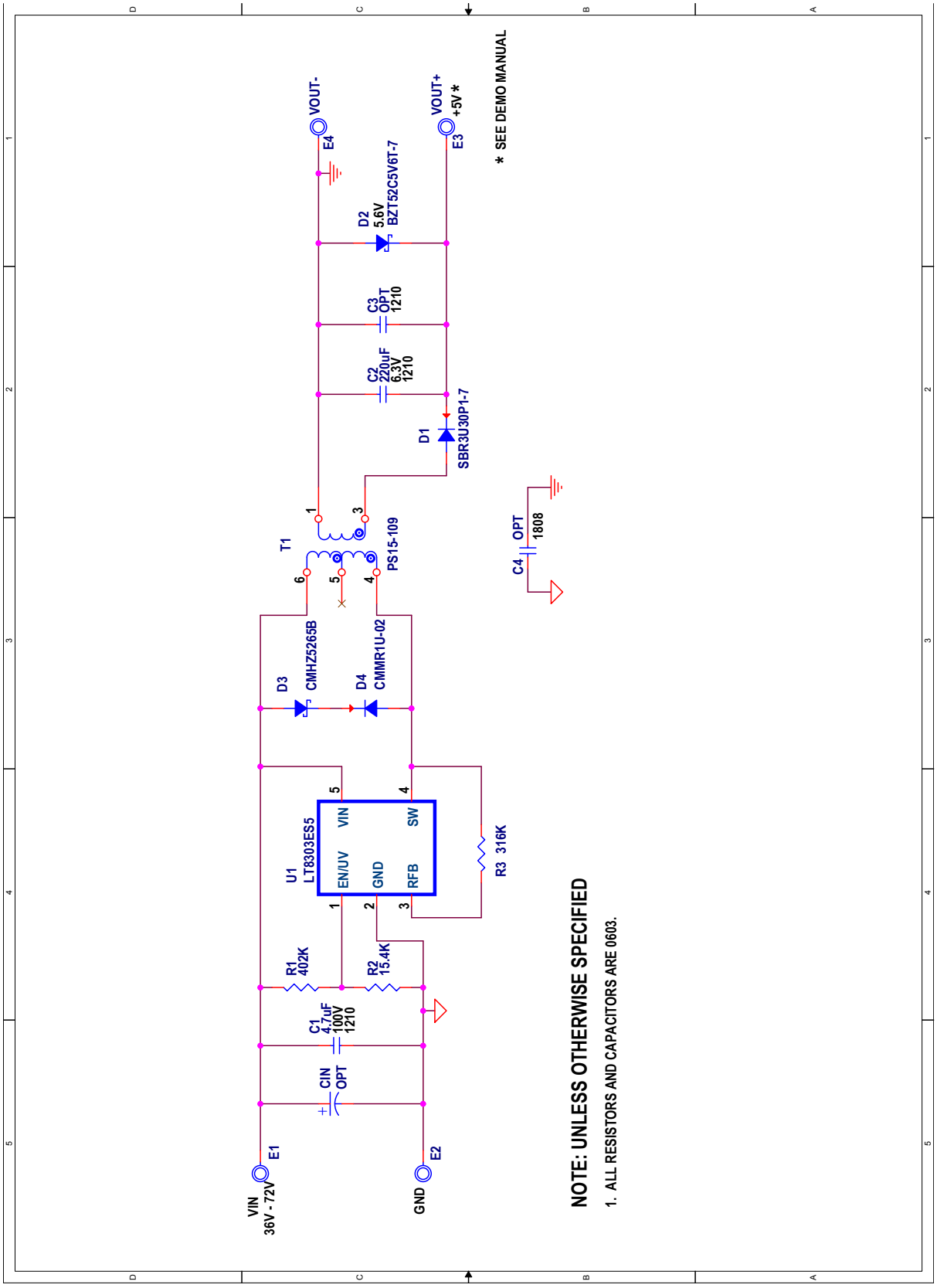


Figure 4. Load and Line Regulation

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, 4.7µF, X7S, 100V, 10% 1210	MURATA, GRJ32DC72A475KE11L
2	1	C2	CAP, 220µF, X5R, 6.3V, 20% 1210	SAMSUNG, CL32A227MQVNNNE
3	1	D1	DIODE, SCHOTTKY, 30V, 3A, PowerDI123	DIODES INC, SBR3U30P1-7
4	1	D2	DIODE, ZENER, 5.6V, 300mW, SOD-523	DIODES INC, BZT52C5V6T-7
5	1	D3	DIODE, ZENER, 62V, SOD-123	CENTRAL SEMI, CMHZ5265B
6	1	D4	DIODE, 200V, SOD-123	CENTRAL SEMI, CMMR1U-02
7	1	R1	RES, 402k, 1/10W, 1%, 0603	VISHAY, CRCW0603402KFKEA
8	1	R2	RES, 15.4k, 1/10W, 1% 0603	VISHAY, CRCW060315K4FKEA
9	1	R3	RES, 316k, 1/10W, 1%, 0603	VISHAY, CRCW0603316KFKEA
10	1	T1	TRANSFORMER, PS15-109	SUMIDA, PS15-109
11	1	U1	IC, LT8303ES5#PBF, TSOT23-5	LINEAR TECHNOLOGY, LT8303ES5#PBF
Additional Demo Board Circuit Components				
1	0	C3 (OPT)	CAP, OPT, 1210	
2	0	C4 (OPT)	CAP, OPT, 1808	
3	0	CIN (OPT)	CAP, 10µF, ALUM, 80V	
Hardware: For Demo Board Only				
1	4	E1 TO E4	TESTPOINT, TURRET, 0.094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0

SCHEMATIC DIAGRAM



DEMONSTRATION BOARD IMPORTANT NOTICE

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

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

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.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 • FAX: (408) 434-0507 • www.linear.com

LT 0716 • PRINTED IN USA

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Analog Devices Inc.:

DC2490A