

# LT8303

## Micropower No-Opto Isolated Flyback Converter

### DESCRIPTION

Demonstration circuit 2490A is a micropower no-opto isolated flyback converter featuring the [LT<sup>®</sup>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<sup>®</sup> 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<sup>™</sup> 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>**

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

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

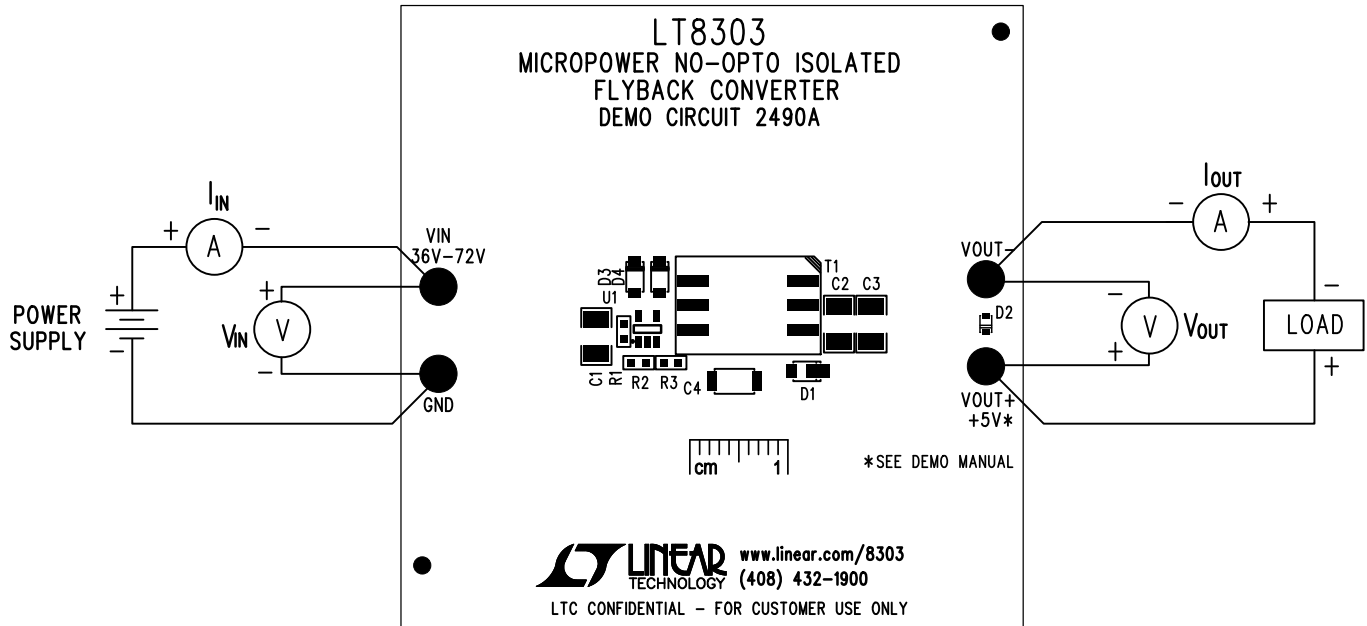
3. Check for the proper output voltages. The output should be regulated at 5V ( $\pm 5\%$ ).

**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 2000 $\Omega$  resistor at the trade-off of lower efficiency.

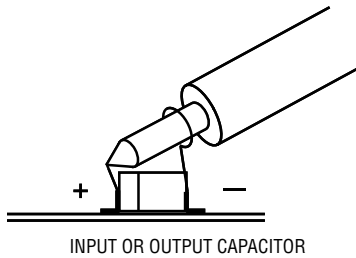
4. Once the proper output voltage is established, adjust the input voltage and load current within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

**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.

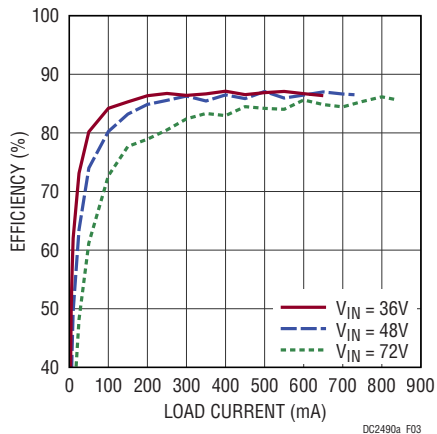
**QUICK START PROCEDURE**



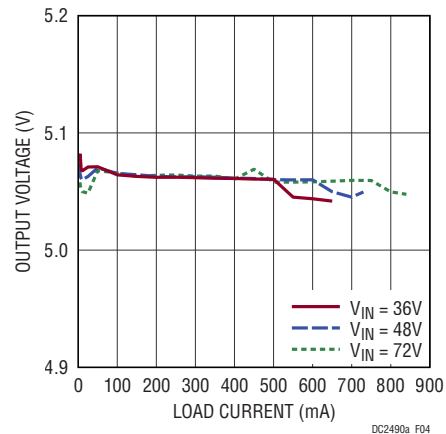
**Figure 1. Proper Measurement Equipment Setup**



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



**Figure 3. Efficiency vs Load Current**



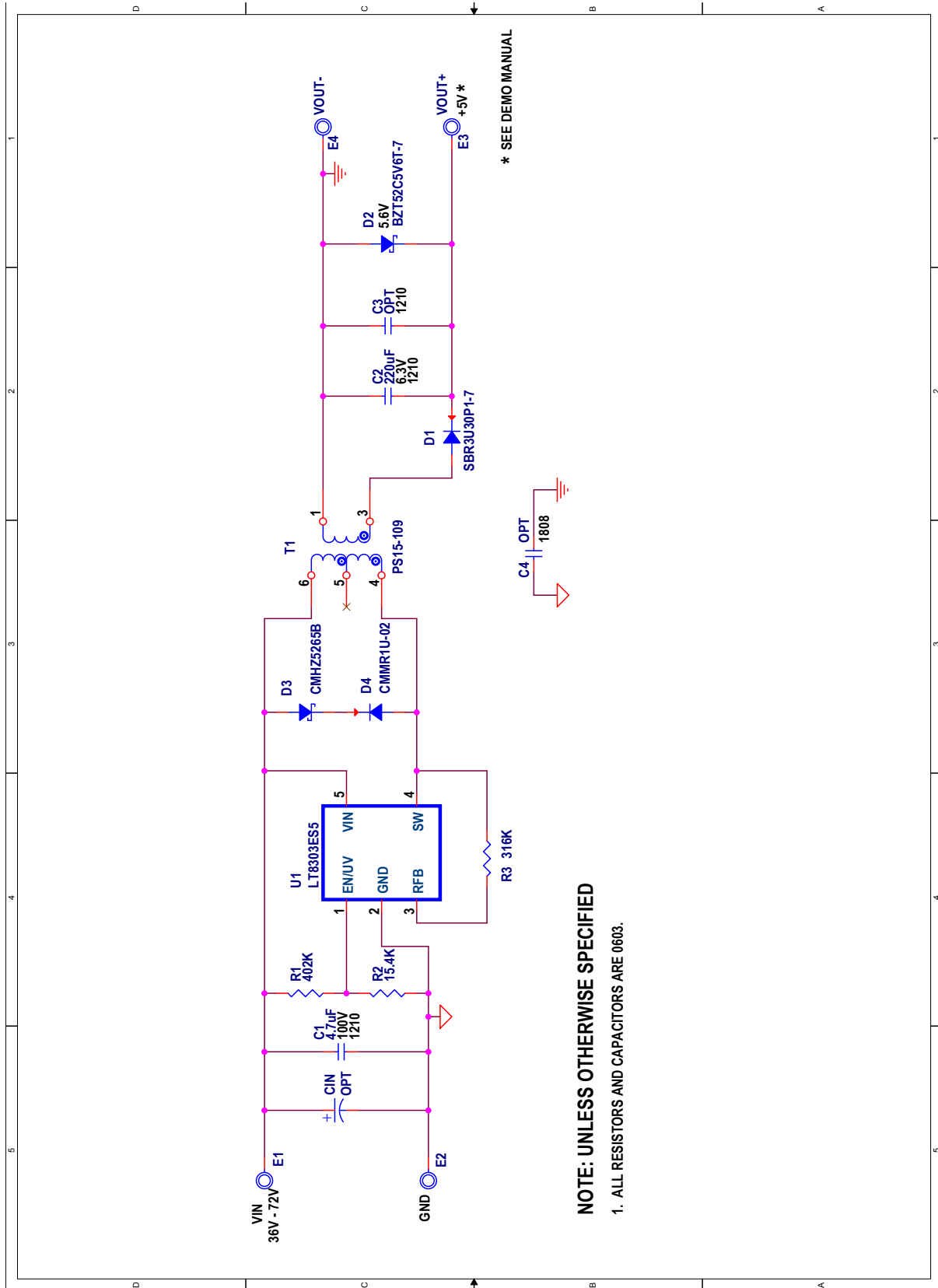
**Figure 4. Load and Line Regulation**

# DEMO MANUAL DC2490A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	1	C1	CAP, 4.7 $\mu$ F, X7S, 100V, 10% 1210	MURATA, GRJ32DC72A475KE11L
2	1	C2	CAP, 220 $\mu$ F, 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
<b>Additional Demo Board Circuit Components</b>				
1	0	C3 (OPT)	CAP, OPT, 1210	
2	0	C4 (OPT)	CAP, OPT, 1808	
3	0	CIN (OPT)	CAP, 10 $\mu$ F, ALUM, 80V	
<b>Hardware: For Demo Board Only</b>				
1	4	E1 TO E4	TESTPOINT, TURRET, 0.094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0

**SCHEMATIC DIAGRAM**



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