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LT8302 Micropower No-Opto Isolated Flyback Converter

DESCRIPTION

Demonstration circuit 2014A is a micropower No-Opto isolated flyback converter featuring the LT®8302. This demo circuit outputs 5V, and maintains tight regulation with a load current from 10mA to 2.2A over an input voltage from 10V to 30V. The output current capability increases with the input voltage.

The LT8302 typically needs less than 0.5% of its full output power as a minimum load to maintain good output voltage regulation. On the DC2014A, in order to avoid pre-loading, a 5.6V Zener diode is placed between its V_{OUT}^+ and V_{OUT}^- to serve as a minimum load.

Transformer leakage inductance causes a voltage spike on the primary side after the power switch turns off. To limit this leakage inductance spike within MOSFET voltage rating of 65V, an RC snubber and a TVS clamp are installed to damp the ringing and clamp the MOSFET drain voltage to a safe level.

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 pre-designed transformers.

The LT®8302 is a simple to use monolithic micropower 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 two external resistors and a third optional temperature compensation resistor. By integrating the loop compensation and soft-start inside, the part reduces the number of external components. 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 3.6A, 65V DMOS power switch is integrated along with all the high voltage circuitry and control logic into a thermally enhanced 8-lead SO package.

The LT8302 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 2014A.

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

PERFORMANCE SUMMARY Specifications are at $T_A = 25°C$

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage		10	24	30	V
Output Voltage	V_{IN} = 10V to 30V, I_{OUT} = 10mA to 2.2A	4.75	5	5.25	V
Maximum Output Current	V_{IN} > 15V	2.2			A
Output Voltage Ripple (Peak to Peak)	V_{IN} = 10V to 30V, I_{OUT} = 2.2A			100	mV
Typical Switching Frequency	V_{IN} = 24V, I_{OUT} = 2.2A		345		kHz
Minimum Switching Frequency	I_{OUT} = 0mA		12		kHz
Efficiency	V_{IN} = 10V, I_{OUT} = 2.2A V_{IN} = 24V, I_{OUT} = 2.2A V_{IN} = 30V, I_{OUT} = 2.2A		80 84 84		% % %

QUICK START PROCEDURE

Demonstration circuit 2014A is easy to set up to evaluate the performance of the LT8302. Refer to Figure 1 for proper measurement equipment setup and follow the procedure:

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 10V.

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 5.0V (±5%).

NOTE: The LT8302 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 560Ω resistor at the tradeoff 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 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} (E1) and GND (E2), or V_{OUT}^+ (E3) and V_{OUT}^- (E4) terminals. See Figure 2 for proper scope probe technique.

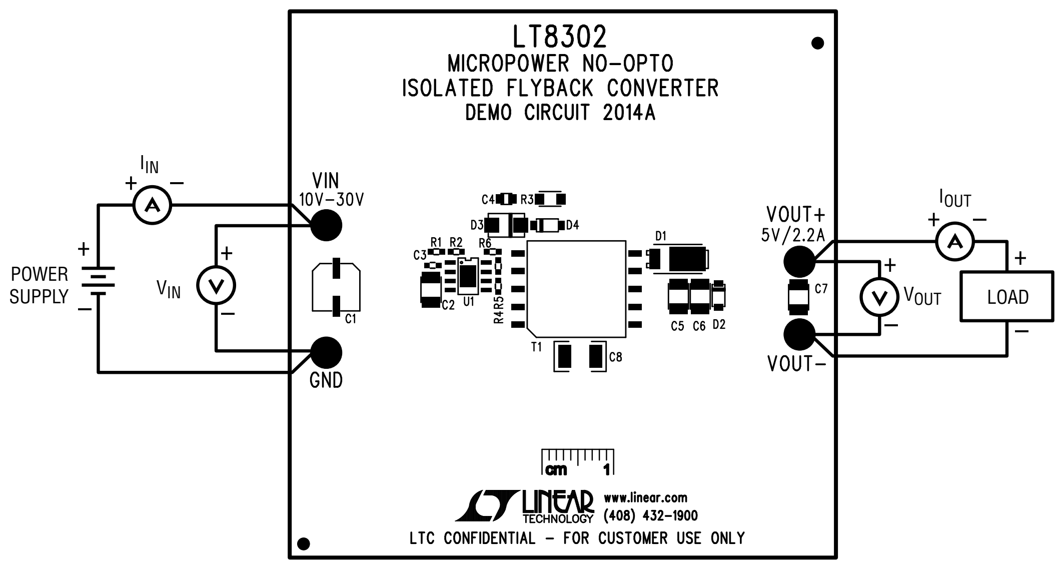


Figure 1. Proper Measurement Equipment Setup

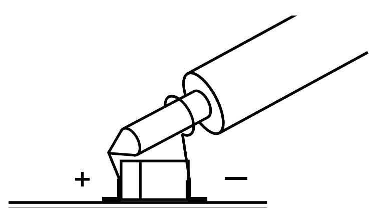


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

QUICK START PROCEDURE

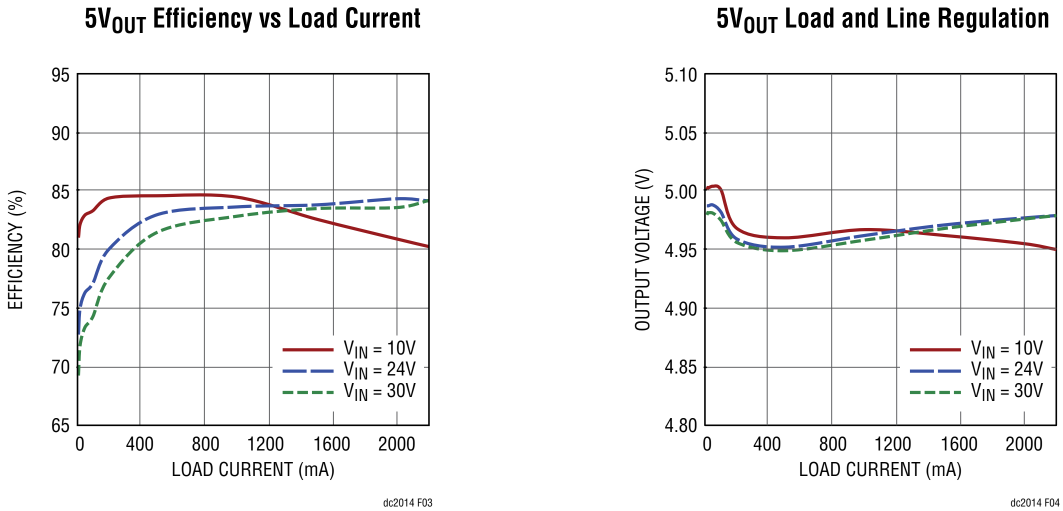
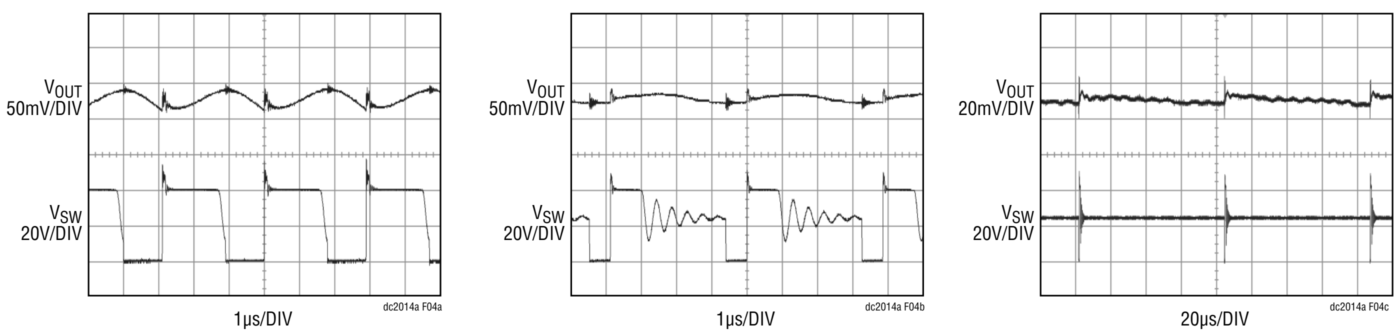


Figure 3. Typical Efficiency and Regulation Curves



V_{IN} = 24V, I_{OUT} = 2.2A, Quasi-Resonant Boundary Mode

V_{IN} = 24V, I_{OUT} = 0.5A, Discontinuous Mode

V_{IN} = 24V, I_{OUT} = 0, Low Ripple Burst Mode

Figure 4. V_{OUT} Ripple and Switch Node Voltage Waveforms at Different Load Conditions

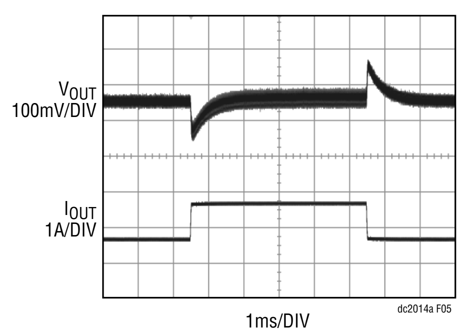
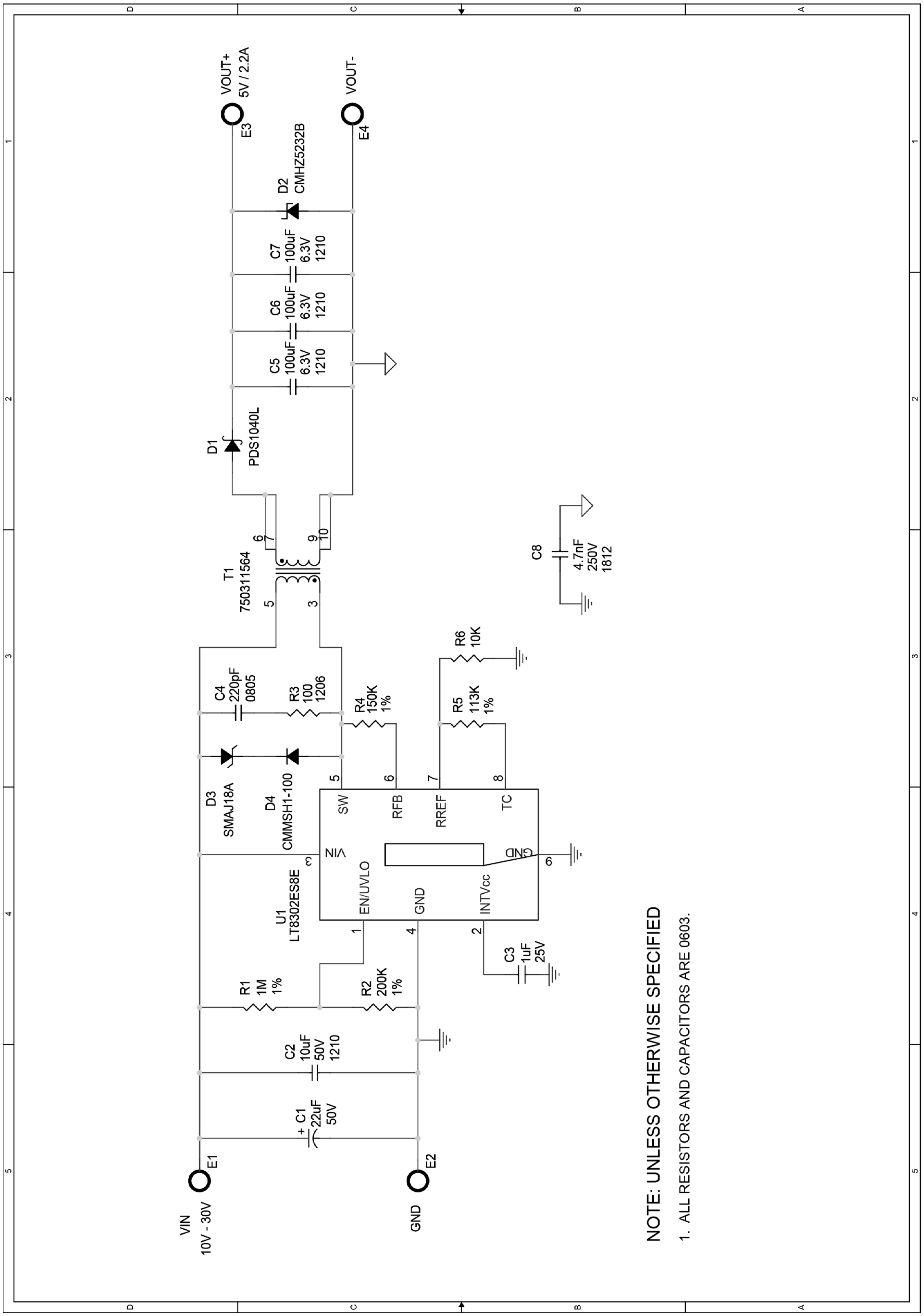


Figure 5. Load Transient Responses (V_{IN} = 24V, Load transient between 1A and 2A)

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP.,ALUM. ELEC. 22µF, 50V,	NIPPON CHEMI-COM, EMZA500ADA220MF61G
2	1	C2	CAP., CHIP, X5R, 10µF, 50V, 10% 1210	Taiyo Yuden, UMK325BJ106K
3	1	C3	CAP., CHIP, X5R, 1µF, 25V, 10% 0603	AVX, 06033D105KAT2A
4	1	C4	CAP., CHIP, C0G, 220pF, 50V, 5% 0805	AVX, 08055A221JAT2A
5	3	C5, C6, C7	CAP., CHIP, X5R, 100µF, 6.3V, 10% 1210	AVX, 12106D107KAT2A
6	1	C8	CAP., CHIP, X7R, 4.7nF, 250V, 10% 1812	MURATR, GA343DRGD472KW01L
7	1	D1	DIODE, PDS1040L, PowerDI-5	Diodes Inc., PDS1040L-13
8	1	D2	DIODE, CMHZ5232B, SOD-123	Central Semi., CMHZ5232B
9	1	D3	DIODE, SMAJ18A, SMA	Diodes Inc., SMAJ18A-13-F
10	1	D4	DIODE, CMMSH1-100, SOD-123F	Central Semi., CMMSH1-100G TR
11	1	R1	RES., CHIP, 1M, 1/10W, 1% 0603	VISHAY, CRCW06031M0FKEA
12	1	R2	RES., CHIP, 200k, 1/10W, 1% 0603	VISHAY, CRCW0603200KFKEA
13	1	R3	RES., CHIP, 100, 1/4W, 5% 1206	VISHAY, CRCW1206100RJNEA
14	1	R4	RES., CHIP, 150k, 1/10W, 1% 0603	VISHAY, CRCW0603150KFKEA
15	1	R5	RES., CHIP, 113k, 1/10W, 1% 0603	VISHAY, CRCW0603113KFKEA
16	1	R6	RES., CHIP, 10k, 1/10W, 1% 0603	VISHAY, CRCW060310K0FKEA
17	1	T1	TRANFORMER, 750311564	WURTH ELEC., 750311564
18	1	U1	I.C. LT8302 SO8E	LINEAR TECH., LT8302ES8E#PBF
Hardware: For Demo Board Only				
1	4	E1-E4	TESTPOINT, TURRET, .094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0

SCHEMATIC DIAGRAM



dc2014af

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