LT8301
42V_{IN} Micropower Isolated Flyback Converter with 65V/1.2A Switch

DESCRIPTION

Demonstration circuit 2138B is an isolated flyback converter featuring the LT®8301. This demo circuit outputs 5V from a 10V to 32V input, with a nominal of 24V. The output current capability increases with the input voltage. The standby input current of the demo circuit is less than 950µA (typical) at V_{IN} = 24V.

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 DC2138B needs a very small minimum load (~6mA) to regulate the output voltage, thanks to the accurate current limit capability and ultralow switching frequency of LT8301 at very light load. On the board, a Zener diode is placed on the output to clamp the voltage to ~5V. This Zener is optional, and can be replaced with a 0.8k resistor.

The LT8301 is a simple-to-use monolithic isolated flyback converter. No third winding or opto-isolator is required for regulation. The part sets the isolated output voltage with a single external resistor and integrates loop compensation and soft-start circuitry inside the IC. Boundary mode operation provides a small magnetic solution with improved load regulation. Low-ripple Burst Mode® operation maintains high efficiency at light loads while minimizing the output voltage ripple. A 1.2A, 65V DMOS power switch is integrated along with all high-voltage circuitry and control logic into a 5-lead ThinSOT™ package.

The LT8301 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 2138B.

Design files for this circuit board are available at http://www.linear.com/demo/DC2138B

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage		10	24	32	V
Standby Current	IOUT = 0mA, VIN = 24V, VOUT = 5V		950		µA
Output Voltage	VIN = 12V to 32V, IOUT = 6mA to 700mA	4.75	5	5.25	V
Maximum Output Current	VIN = 12V VIN = 24V	700 1000			mA mA
Output Voltage Ripple (Peak to Peak)	VIN = 24V, IOUT = 1A		90		mV
Switching Frequency	VIN = 24V, IOUT = 1A		190		kHz
Efficiency	VIN = 24V, IOUT = 1A		83.2		%

QUICK START PROCEDURE

Demo circuit 2138B is easy to set up to evaluate the performance of the LT8301. Refer to Figure 1 for proper equipment setup and follow the procedure below.

1. With power off, connect the input power supply to the board through VIN and GND terminals. Connect the load to the terminals VOUT+ and VOUT– on the board.
2. Turn on the power at the input. Increase VIN 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.

   NOTE. To run overload tests on the demo board at high line, additional RC snubber might be needed to make sure the voltage spike at the switching node is always less than 65V.
3. Check for the proper output voltages. The output should be regulated at 5V (±5%).

   NOTE. The LT8301 requires very small minimum load to maintain good output voltage regulation. A Zener diode is placed on the output to clamp the voltage to ~5V. This Zener is optional, and can be replaced with a 0.8k resistor.
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, transient, 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 or VOUT capacitor terminals. See Figure 2 for proper scope probe technique.
5. Figure 5 shows the radiated EMI (Vertical Polarization) performance with the installation of the optional component (C9 560pF). The circuit passed the CISPR 25 Class 5 Peak Limit 5, with less than 2 percentage of efficiency drop at full load condition (0.7A, 14V_{IN}).

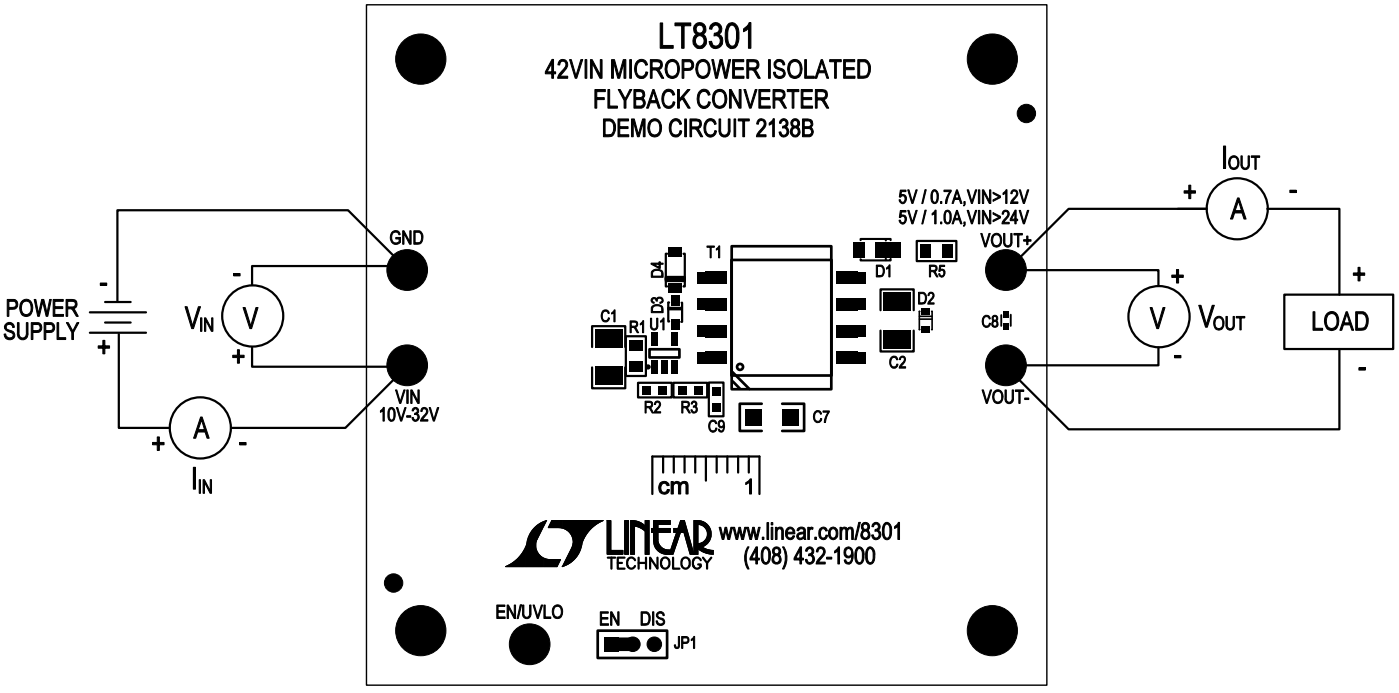


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

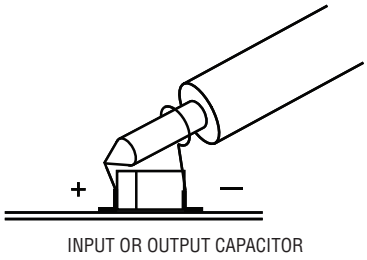


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

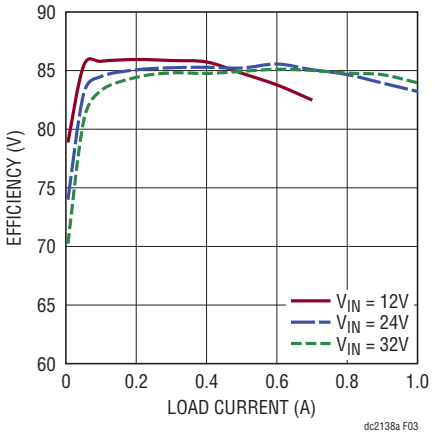


Figure 3. Typical Efficiency Curves

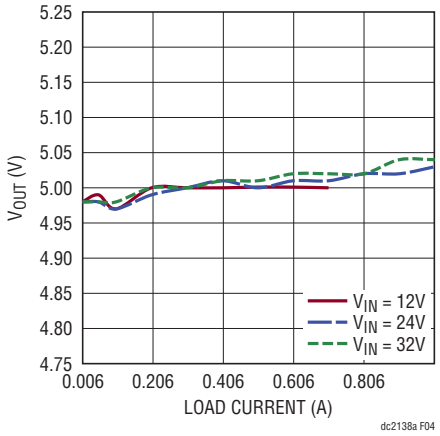


Figure 4. Typical Regulation Curves

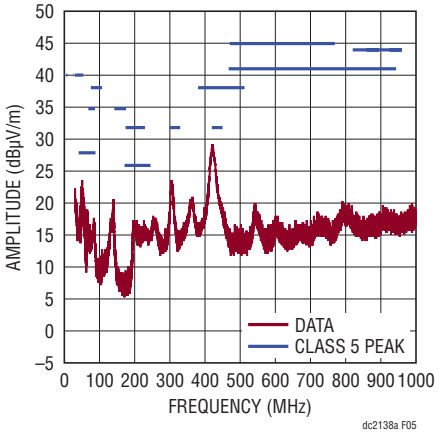
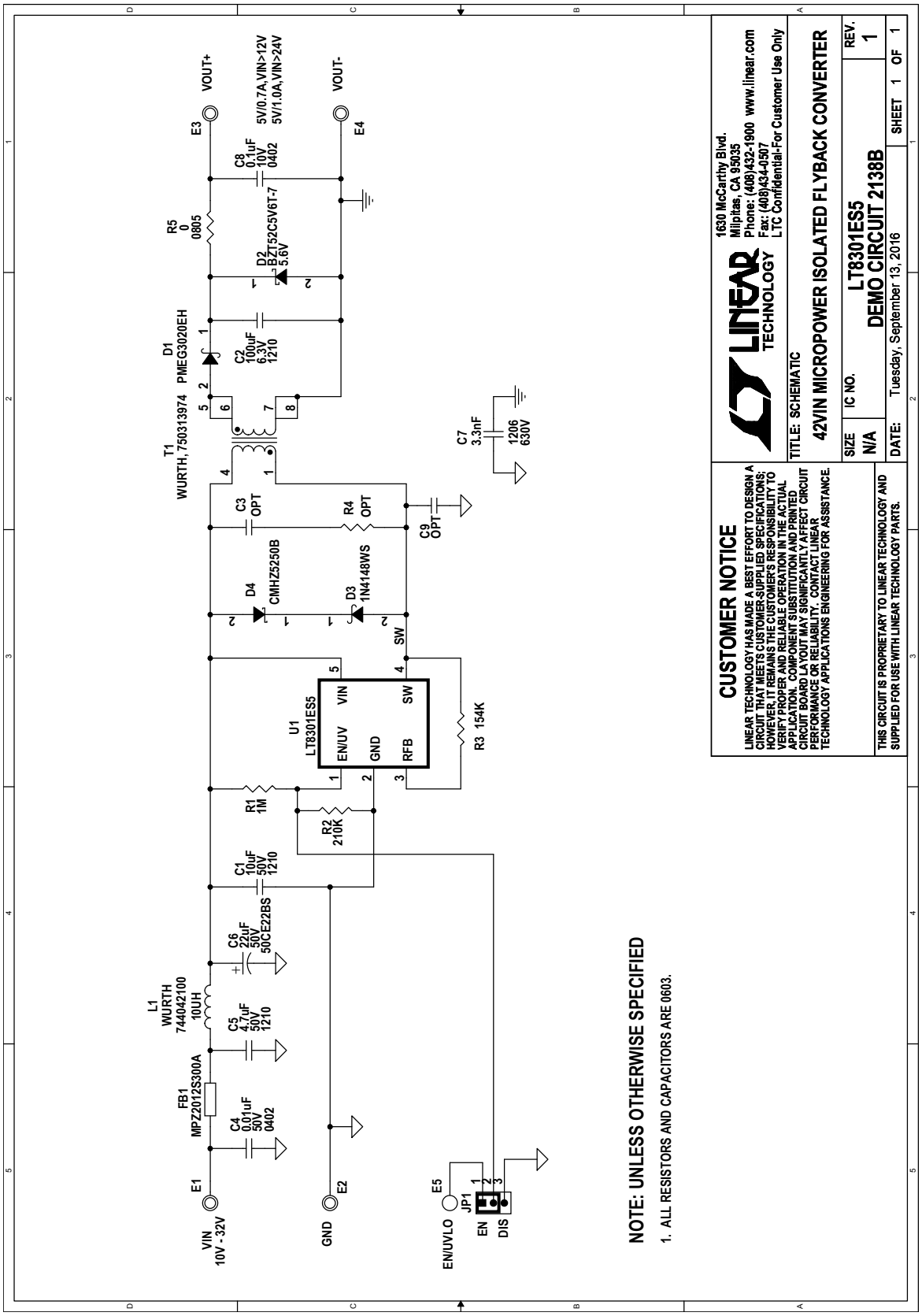


Figure 5. Radiated EMI Vertical polarization, CISPR 25 Peak Limit 5, 14V_{IN}, 0.7A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., X7R, 10µF, 50V, 10%, 1210	MURATA, GRM32ER71H106KA12L
2	1	C2	CAP., X5R, 100µF, 6.3V, 20%, 1210	MURATA, GRM32ER60J107ME20L
3	1	C4	CAP., X7R, 0.01µF, 50V, 10%, 0402	MURATA, GRM155R71H103KA88D
4	1	C5	CAP., X7R, 4.7µF, 50V, 10%, 1210	AVX, 12105C475KAT2A
5	1	C6	CAP., ALUM., 22µF, 50V	SUN ELECT., 50CE22BS
6	1	C7	CAP., X7R, 3300pF, 630V, 10%, 1206	MURATA, GRM31BR72J332KW01L
7	1	C8	CAP., X7R, 0.1µF, 10V, 10%, 0402	MURATA, GRM155R71A104KA01D
8	1	D1	DIODE, PMEG3020EH, SOD-123	NXP, PMEG3020EH
9	1	D2	DIODE, 5.6V, SOD-523	DIODES., BZT52C5V6T-7-F
10	1	D3	DIODE., 1N4148WS SOD323	DIODES., 1N4148WS-7-F
11	1	D4	DIODE, CMHZ5250B, SOD-123	CENTRAL., CMHZ5250B
12	1	FB1	BEAD, 0805	TDK, MPZ2012S300A
13	1	L1	IND., 10µH	WURTH, 744042100
14	1	R1	RES., CHIP, 1M, 1/8W, 1% 0805	VISHAY, CRCW08051M00FKEA
15	1	R2	RES., CHIP, 210k, 1/10W, 1% 0603	VISHAY, CRCW0603210KFKEA
16	1	R3	RES., CHIP, 154k, 1/10W, 1% 0603	VISHAY, CRCW0603154KFKEA
17	1	R5	RES., CHIP, 0Ω, 1/8W, 1% 0805	VISHAY, CRCW08050000Z0EA
18	1	T1	TRANSFORMER, 750313974	WURTH, 750313974
19	1	U1	I.C. FLYBACK CONVERTER, SOT23-5	LINEAR TECH., LT8301ES5#PBF
Additional Demo Board Circuit Components				
1	0	R4(OPT)	RES., CHIP, 0805	
2	0	C3, C9(OPT)	CAP., 0603	
Hardware: For Demo Board Only				
1	5	E1-E5	TESTPOINT, TURRET, 0.094" 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, 0.079" CENTER	SAMTEC, 2SN-BK-G

SCHEMATIC DIAGRAM



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