LT8310
48V_{IN} to 12V/6A
Isolated Forward Converter

DESCRIPTION

Demonstration circuit 1963A is a resonant reset forward converter featuring the LT®8310 controller.

This circuit was designed to demonstrate the high level of performance, and small solution size attainable using the LT8310. It operates at a 250kHz switching frequency, and regulates a 12V, 6A output from a 36V to 72V input source, making it well suited for telecom, industrial, and other applications. Table 1 summarizes the performance of the DC1963A.

The LT8310 is a constant-frequency forward converter controller with a low side N-channel MOSFET gate driver. Output regulation is handled on the secondary side by the LT1431, which is an adjustable shunt voltage regulator providing feedback to the primary side via an opto-coupler.

The DC1963A takes advantage of the LT8310's input undervoltage and overvoltage protection to shutdown the system when the input voltage is outside of the set limits. The DC1963A also has precise overcurrent protection that allows for continuous operation under short circuit conditions. The low power dissipation under a short circuit condition ensures high reliability even during a prolonged output voltage short circuit.

The LT8310 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 1963A.

Design files for this circuit board are available at http://www.linear.com/demo/DC1963A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage		36	48	72	V
Output Voltage	V_{IN} = 36V – 72V	11.76	12	12.24	V
Maximum Output Current		6			A
Switching (Clock) Frequency			250		kHz
Output Voltage Ripple (Peak-to-Peak)	V_{IN} = 36V – 72V, I_{OUT} = 6A (20MHz BW)		50		mV
Output Regulation	Line and Load (36V to 72V_{IN}, 0A to 6A_{OUT})		±0.1		%
Efficiency (See Figure 3)	V_{IN} = 36V, I_{OUT} = 6A		91		%
	V_{IN} = 48V, I_{OUT} = 6A		91.5		%
	V_{IN} = 72V, I_{OUT} = 6A		90.5		%

QUICK START PROCEDURE

Demonstration circuit 1963A is easy to set up to evaluate the performance of the LT8310. 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 $+V_{IN}$ and $-V_{IN}$ terminals. Connect the load to the terminals $+V_{OUT}$ and $-V_{OUT}$ on the board.
2. Turn on the power at the input.

NOTE: Make sure that the input voltage does not exceed 72V. Input voltages lower than 36V can keep the converter from turning on due to the undervoltage lockout feature of the LT8310.

3. Check for the proper output voltages. The output should be regulated at 12V (±2%).

NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

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 $+V_{IN}$ and $-V_{IN}$, or $+V_{OUT}$ and $-V_{OUT}$ terminals. See Figure 2 for proper scope probe technique.

QUICK START PROCEDURE

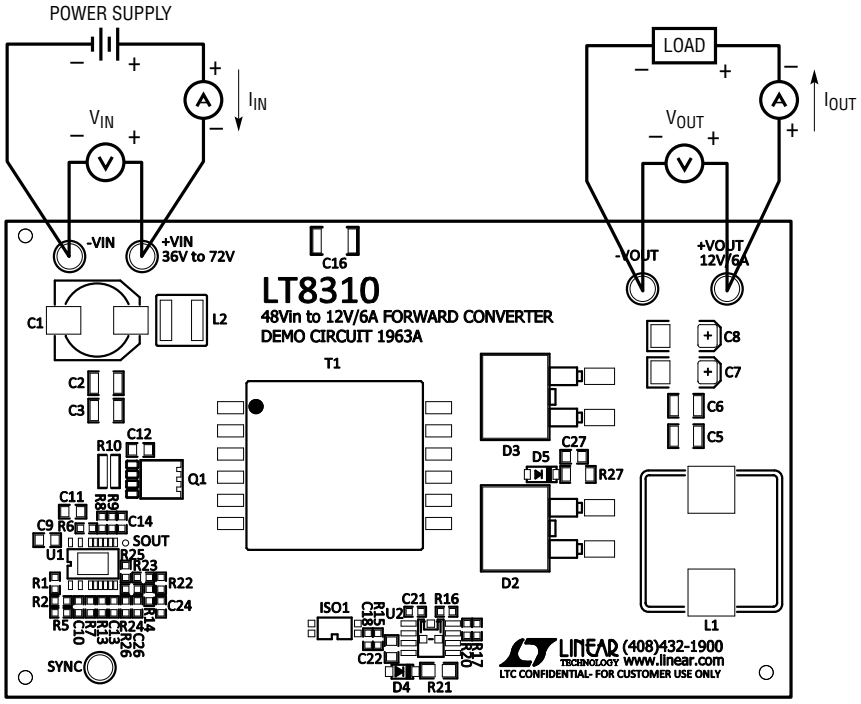


Figure 1. Proper Measurement Equipment Setup

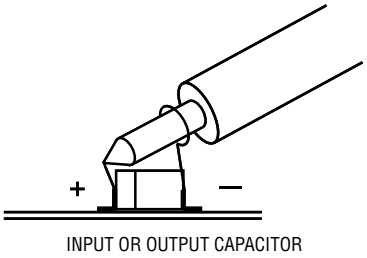


Figure 2. Proper Scope Probe Placement for Measuring Input/Output Ripple

PERFORMANCE

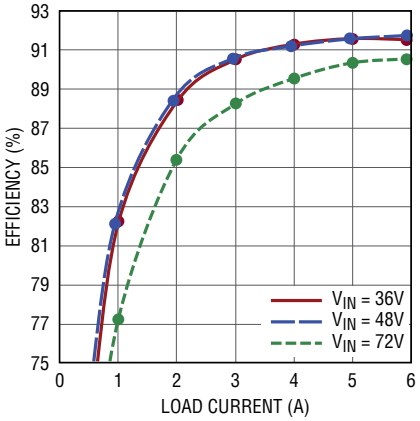
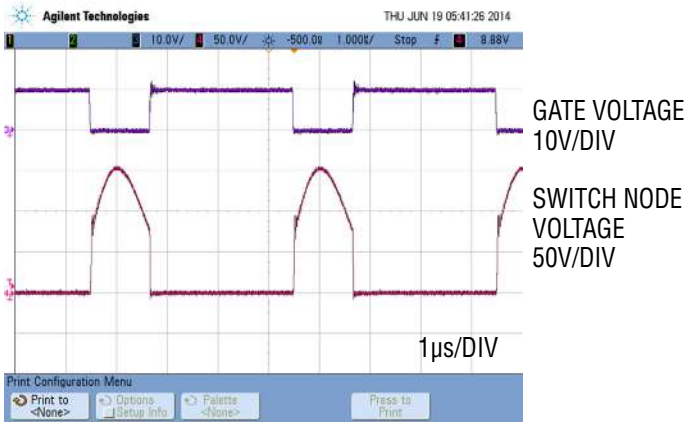
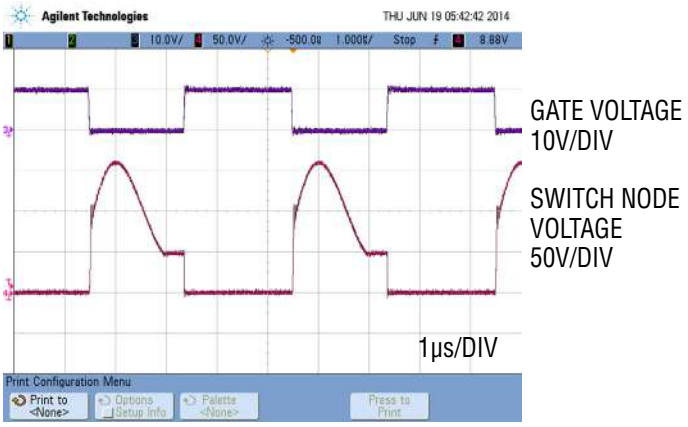


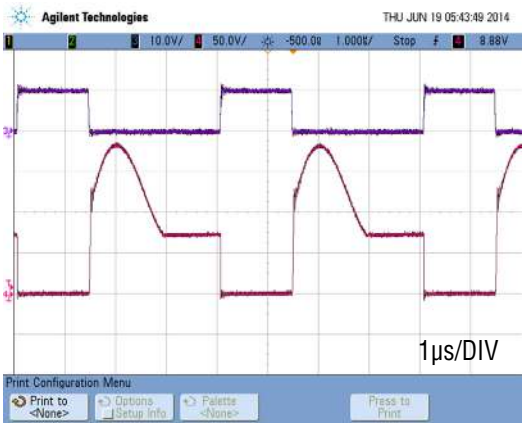
Figure 3. Typical Efficiency Curve



(4a) $36V_{IN}$ to $6A_{OUT}$



(4b) $48V_{IN}$ to $6A_{OUT}$



(4c) $72V_{IN}$ to $6A_{OUT}$

Figure 4. Steady State Waveforms

PERFORMANCE

Figure 5. Output Short-Circuit Waveforms at $72V_{IN}$

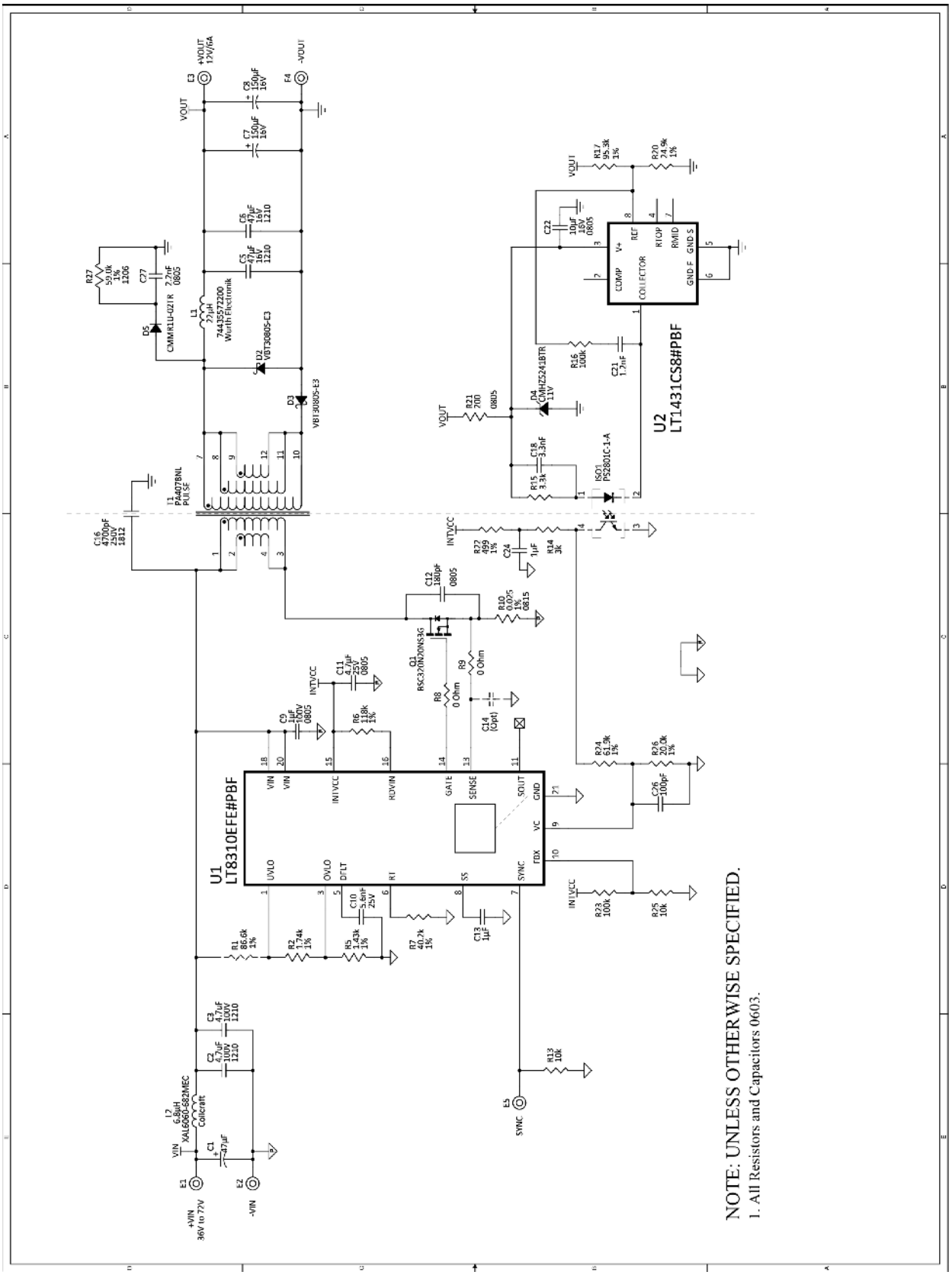
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	Cap., Alum. Elect. 47µF, 80V, ±20%	United Chemi-Con EMZA800ADA470MJA0G
2	2	C2, C3	Cap., X7S 4.7µF, 100V, 10%, 1210	TDK C3225X7S2A475K
3	2	C5, C6	Cap., X5R 47µF, 16V, 20%, 1210	Murata GRM32ER61C476ME15L
4	2	C7, C8	Cap., POSCAP 150µF, 16V, 10%, 7343	SANYO 16TQC150MYF
5	1	C9	Cap., X7S 1µF, 100V, 10%, 0805	TDK C2012X7S2A105K
6	1	C10	Cap., COG 5.6nF, 25V, 5%, 0603	TDK C1608C0G1E562J080AA
7	1	C11	Cap., X5R 4.7µF, 25V, 10%, 0805	AVX 08053D475KAT2A
8	1	C12	CAP CER 180pF, 450V, 5%, NP0 0805	TDK C2012C0G2W181J
9	2	C13, C24	Cap., X5R 1µF, 25V, 20%, 0603	AVX 06033D105MAT2A
10	1	C16	Cap., X7R 4700pF, 250V, 20%, 1812	MurataErie GA343DR7GD472KW01L
11	1	C18	Cap., X7R 3.3nF, 50V, 10%, 0603	AVX 06035C332KAT2A (to FT223A)
12	1	C21	Cap., X7R 1.2nF, 25V, 10%, 0603	AVX 06033C122KAT1A
13	1	C22	Cap., X5R 10µF, 16V, 20%, 0805	AVX 0805YD106MAT2A (from FT182/189A)
14	1	C26	Cap., NPO 100pF, 25V, 5%, 0603	AVX 06033A101JAT2A
15	1	C27	Cap., U2J 2.2nF, 250V, 5%, 0805	Murata GRM21A7U2D222JW31
16	2	D2, D3	Schottky Diode, 30A/80V, TO-263AB	Vishay Semi. VBT3080S-E3
17	1	D4	Zener Diode, 11V SOD-123	Central Semi. CMHZ5241BTR
18	1	D5	Diode, 1A/200V SOD-123	Central Semi. CMMR1U-02TR
19	1	ISO1	Opto Iso., NEPOC Series	NEC PS2801C-1-A
20	1	L1	Inductor, 22µH	Würth Electronik 74435572200
21	1	L2	Inductor, 6.8µH	Coilcraft XAL6060-682MEC
22	1	Q1	Mosfet-N Channel, 200V/36A SuperSO8	Infineon BSC320N20NS3G
23	1	R1	Res., Chip 86.6k, 0.06W, 1%, 0603	Vishay CRCW060386K6FKEA
24	1	R2	Res., Chip 1.74k, 0.10W, 1%, 0603	Vishay CRCW06031K74FKEA

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
25	1	R5	Res., Chip 1.43k, 0.10W, 1%, 0603	Vishay CRCW06031K43FKEA
26	1	R6	Res., Chip 118k, 0.06W, 1%, 0603	Vishay CRCW0603118KFKEA
27	1	R7	Res., Chip 40.2k, 0.06W, 1%, 0603	Vishay CRCW060340K2FKEA
28	2	R8, R9	Res/Jumper, Chip 0Ω, 1/16W, 1 AMP 0603	Vishay CRCW06030000Z0EA
29	1	R10	Res., RL Vert. 0.025, 1W, 1%, 0815	SSM Thin Film Tech. RL3720WT-R025-F
30	2	R13, R25	Res., Chip 10k, 0.06W, 5%, 0603	Vishay CRCW060310K0JNEA
31	1	R14	Res., Chip 3k, 0.06W, 5%, 0603	Vishay CRCW06033K00JNEA
32	1	R15	Res., Chip 3.3k, 0.06W, 5%, 0603	Vishay CRCW06033K30JNEA
33	2	R16, R23	Res., Chip 100k, 0.06W, 5%, 0603	Vishay CRCW0603100KJNEA
34	1	R17	Res., Chip 95.3k, 0.06W, 1%, 0603	Vishay CRCW060395K3FKEA
35	1	R20	Res., Chip 24.9k, 0.06W, 1%, 0603	Vishay CRCW060324K9FKEA
36	1	R21	Res., Chip 200, 0.125W, 1%, 0805	Vishay CRCW0805200RFKEA
37	1	R22	Res., Chip 499, 0.06W, 1%, 0603	Vishay CRCW0603499RFKEA
38	1	R24	Res., Chip 61.9k, 0.06W, 1%, 0603	Vishay CRCW060361K9FKEA
39	1	R26	Res., Chip 20.0k, 0.06W, 1%, 0603	Vishay CRCW060320K0FKEA
40	1	R27	Res., Chip 59.0k, 0.25W, 1%, 1206	Vishay CRCW120659K0FKEA
41	1	T1	XFMR., PULSE-PA4078NL	PULSE PA4078NL
42	1	U1	I.C., Converter Controller TSSOP20-FE20	Linear Tech. Corp. LT8310EFE#PBF
43	1	U2	I.C., Prog. Reference SO8NB	Linear Tech. Corp. LT1431CS8#PBF
Optional Circuit Components				
1	1	C14	Cap., 0603	
Hardware				
1	5	E1, E2, E3, E4, E5	Turret, Testpoint	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