

LT8302 Compact Isolated Flyback Converter with 65V/3.6A Switch

DESCRIPTION

Demonstration circuit 2821A is a compact no-opto isolated flyback converter featuring the [LT®8302](#). The DC2821A outputs 12V, and maintains $\pm 1\%$ (typ) regulation with a load current from 5mA up to 1.4A and over an input voltage from 4V to 28V. The output current capability increases with the input voltage, as shown in the Performance Summary table.

Transformer leakage inductance causes a voltage spike on the primary side after the power switch turns off. To limit this leakage inductance spike within the 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 using predesigned transformers.

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 DC2821A.

[Design files for this circuit board are available.](#)

All registered trademarks and trademarks are the property of their respective owners.

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

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage		4	12	28	V
Output Voltage	$I_{OUT(MIN)} = 5\text{mA}$	11.4	12	12.6	V
Maximum Output Current	$V_{IN} = 4\text{V}$	0.4			A
	$V_{IN} = 5\text{V}$	0.5			A
	$V_{IN} = 12\text{V}$	0.9			A
	$V_{IN} = 24\text{V}$	1.3			A
	$V_{IN} = 28\text{V}$	1.4			A
Output Voltage Ripple (Peak-to-Peak)	$V_{IN} = 5\text{V}, I_{OUT} = 0.5\text{A}$		180		mV
	$V_{IN} = 12\text{V}, I_{OUT} = 0.9\text{A}$		130		mV
	$V_{IN} = 24\text{V}, I_{OUT} = 1.3\text{A}$		110		mV
Efficiency	$V_{IN} = 5\text{V}, I_{OUT} = 0.5\text{A}$		86.3		%
	$V_{IN} = 12\text{V}, I_{OUT} = 0.9\text{A}$		89.3		%
	$V_{IN} = 24\text{V}, I_{OUT} = 1.3\text{A}$		89.9		%

QUICK START PROCEDURE

Demonstration circuit 2821A 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 below:

1. With power off, connect the input power supply to the board to the 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 4V.

NOTE: Make sure that the input voltage is always within spec. To operate the board with higher input/output voltages, higher voltage rated components (input capacitor, output capacitor and output diode) might be needed.

3. Check for the proper output voltages. The output should be regulated at 12V ($\pm 5\%$).

NOTE: The LT8302 requires a very small minimum load to maintain a good output voltage regulation. A Zener diode is placed on the output to clamp the voltage to 13V. This Zener can be replaced with a 2.4k resistor with the trade off of slightly 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 input (V_{IN} (E1) and GND (E2)), or output (V_{OUT}^{+} (E3) and V_{OUT}^{-} (E4)) terminals. See Figure 2 for proper scope probe placement technique.

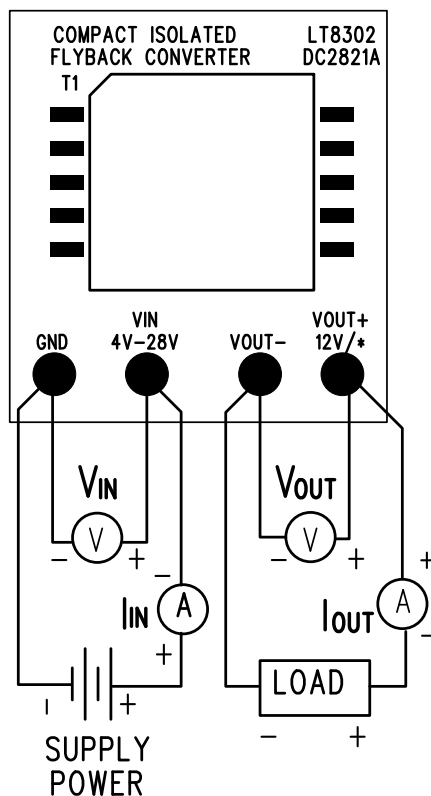


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

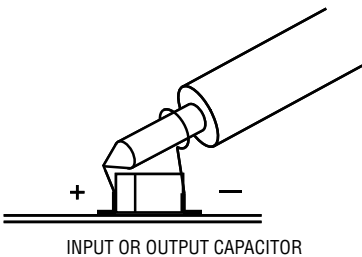


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

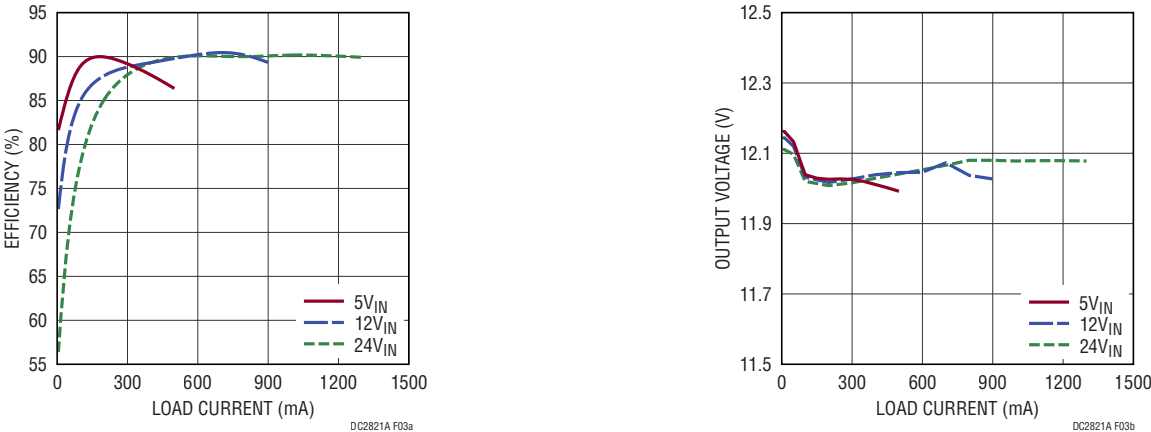


Figure 3. Typical Efficiency and Regulation Curves

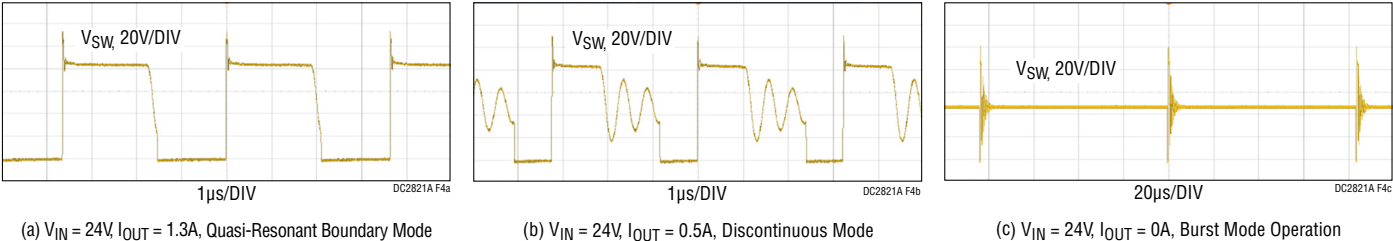


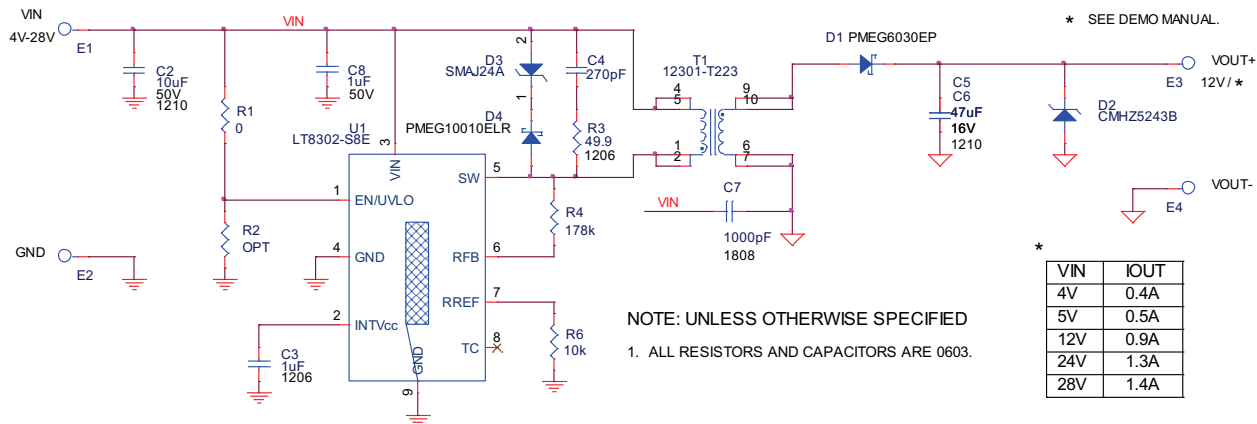
Figure 4. Switch Node Voltage Waveform at Different Load Conditions

DEMO MANUAL DC2821A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER	MANUFACTURER PART NUMBER
Required Circuit Components					
1	1	C2	CAP, 10 μ F, X7R, 50V, 10%, 1210	MURATA	GRM32ER71H106KA12L
2	1	C3	CAP, 1 μ F, X7R, 50V, 10%, 1206	MURATA	MURATA, GRM31CR71H105KA61L
3	1	C4	CAP, 270pF, C0G, 100V, 5%, 0603	TDK CORPORATION	C1608NP02A271J080AA
4	2	C5, C6	CAP, 47 μ F, X5R, 16V, 10%, 1210	MURATA	MURATA, GRM32ER61C476KE15L
5	1	C7	CAP, 1000pF, X7R, 250V, 10%, 1808	MURATA	GA342DR7GF102KW02L
6	1	C8	CAP, 1 μ F, X7R, 50V, 10%, 0603	TAIYO YUDEN	UMK107AB7105KA-T
7	1	D1	DIODE, SCHOTTKY, 60V, 3A, SOD128	NEXPERIA	PMEG6030EP,115
8	1	D2	DIODE, ZENER, 13V, 500mW, SOD-123-2	CENTRAL SEMI.	CMHZ5243B TR PBFREE
9	1	D3	DIODE, TVS, 24V, 400W, 2-PIN SMA	DIODES INC.	SMAJ24A-13-F
10	1	D4	DIODE, SCHOTTKY, 100V, 1A, SOD-123 W-2	NEXPERIA	PMEG10010ELR
11	1	R1	RES., 0 Ω , 1/10W, 0603	VISHAY	CRCW06030000Z0EA
12	1	R3	RES., 49.9 Ω , 1%, 1/4W, 1206	NIC	NRC12F49R9TRF
13	1	R4	RES., 178k, 1%, 1/10W, 0603, SMD	VISHAY	CRCW0603178KFKEA
14	1	R6	RES., 10k, 0.1%, 1/10W, 0603	VISHAY	TNPW060310K0BEEA
15	1	T1	TRANSFORMER, 17mm $\times$ 16mm, SMD	SUMIDA	12301-T223
16	1	U1	IC, FLYBACK CONVERTER, S8E	ANALOG DEVICES, INC.	LT8302ES8E#PBF
Hardware for Demo Board Only					
1	4	E1-E4	TEST POINT, TURRET, 0.064", HOLE	MILL-MAX	2308-2-00-80-00-00-07-0
Optional Circuit Components					
1	0	R2	RES., OPTION, 0603		

SCHEMATIC DIAGRAM



**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. **CONFIDENTIALITY.** This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. **ADDITIONAL RESTRICTIONS.** Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. **TERMINATION.** ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. **LIMITATION OF LIABILITY.** THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). **EXPORT.** Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. **GOVERNING LAW.** This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.