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 ±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.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

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

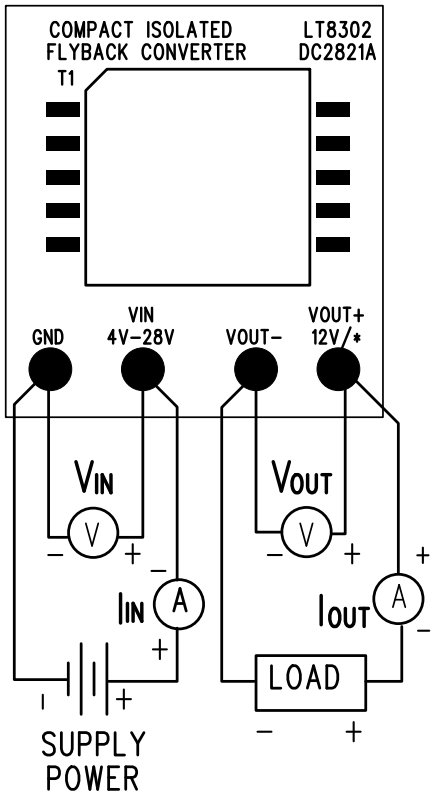


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

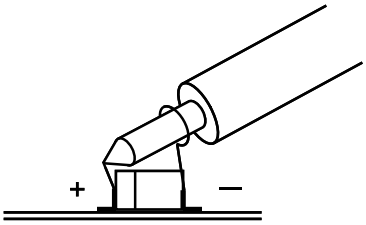


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

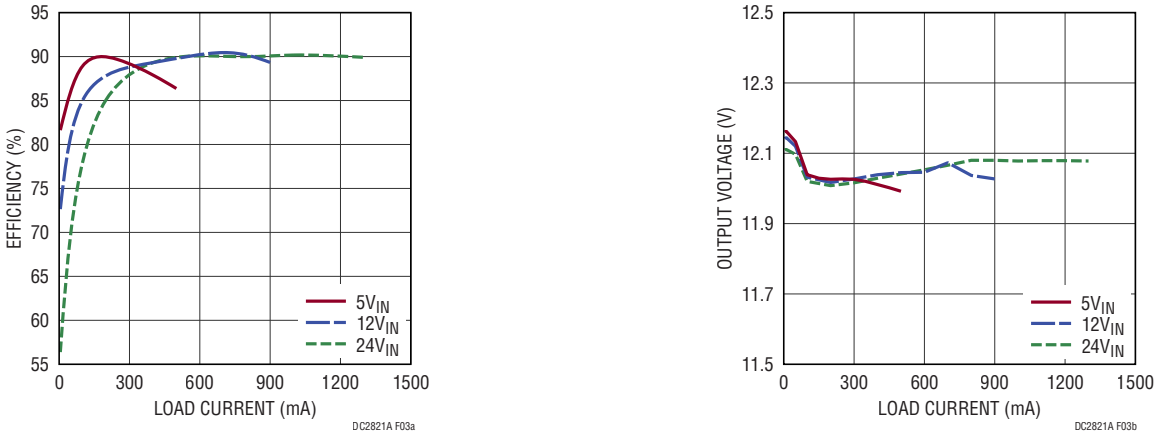
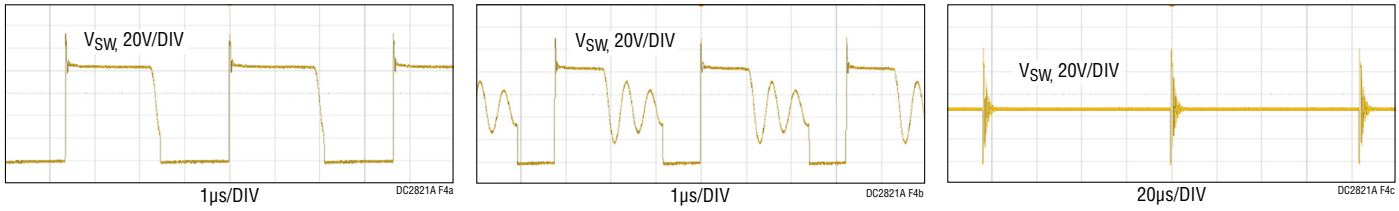


Figure 3. Typical Efficiency and Regulation Curves



(a) V_{IN} = 24V, I_{OUT} = 1.3A, Quasi-Resonant Boundary Mode

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

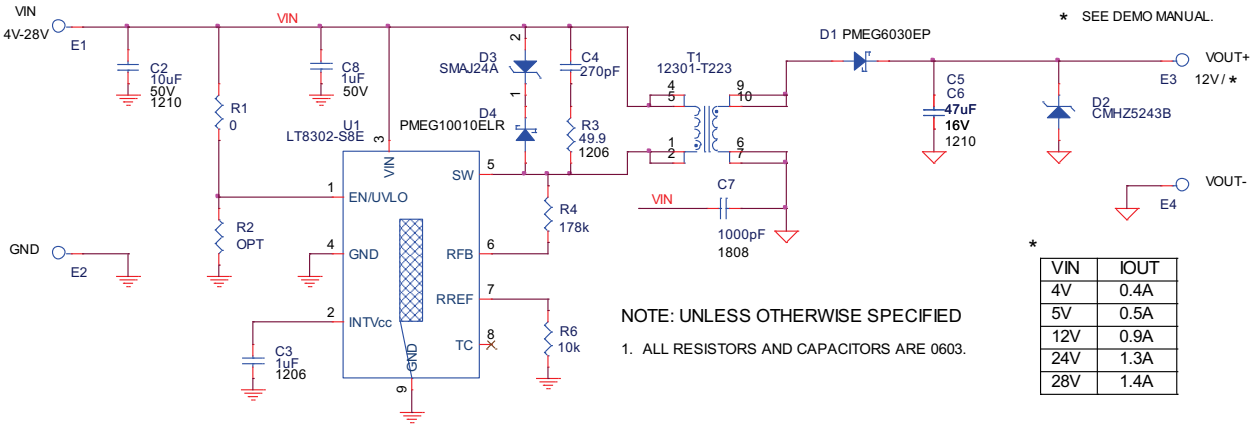
(c) V_{IN} = 24V, I_{OUT} = 0A, Burst Mode Operation

Figure 4. Switch Node Voltage Waveform at Different Load Conditions

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER	MANUFACTURER PART NUMBER
Required Circuit Components					
1	1	C2	CAP., 10µF, X7R, 50V, 10%, 1210	MURATA	GRM32ER71H106KA12L
2	1	C3	CAP., 1µF, X7R, 50V, 10%, 1206	MURATA	MURATA, GRM31CR71H105KA61L
3	1	C4	CAP., 270pF, C0G, 100V, 5%, 0603	TDK CORPORATION	C1608NP02A271J080AA
4	2	C5, C6	CAP., 47µF, X5R, 16V, 10%, 1210	MURATA	MURATA, GRM32ER61C476KE15L
5	1	C7	CAP., 1000pF, X7R, 250V, 10%, 1808	MURATA	GA342DR7GF102KW02L
6	1	C8	CAP., 1µF, 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., 0Ω,1/10W,0603	VISHAY	CRCW06030000Z0EA
12	1	R3	RES., 49.9Ω, 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 × 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



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VIN	IOUT
4V	0.4A
5V	0.5A
12V	0.9A
24V	1.3A
28V	1.4A

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.

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