LT8631
100V, 1A Synchronous Micropower Step-Down Regulator

DESCRIPTION

Demonstration circuit 2110A is a monolithic step-down converter featuring LT®8631. The demo board is designed for 5V output from a 6.5V to 100V input at 400kHz switching frequency. The wide input range makes it suitable for regulating power from a wide variety of sources, including automotive, industrial systems and telecom supplies. The LT8631 is a compact, high efficiency synchronous monolithic step-down switching regulator. The power switch, compensation and other necessary circuits are inside of the LT8631 to minimize external components and simplify design.

The LT8631 switching frequency can be programmed either via oscillator resistor or external clock over a 100kHz to 1MHz range. The SYNC pin on the demo board is grounded (JP1 at Burst Mode® position) by default for low ripple Burst Mode operation. To synchronize to an external clock, move JP1 to SYNC and apply the external clock to the SYNC turret. If the pulse-skipping operation is required, move JP1 to fixed frequency position. Figure 1 shows the efficiency of the circuit at 12V input at the Burst Mode selection.

The demo board has an EMI filter installed. The EMI performance of the board (with EMI filter) is shown in Figure 2. The red line in Figure 2 is CISPR25 Class 5 peak limit. The figure shows that the circuit passes the test with a wide margin. To achieve EMI/EMC performance as shown in Figure 2, the input EMI filter is required and the input voltage should be applied at V_{EMI} turret pin, not V_{IN}.

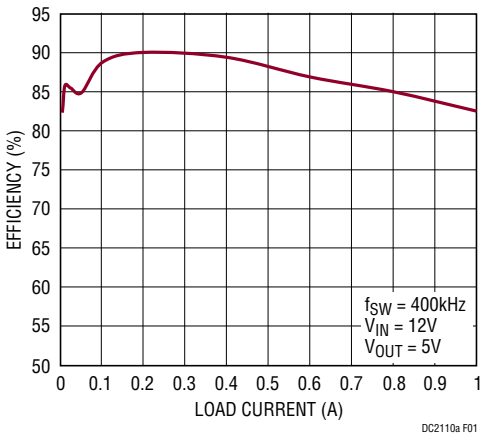


Figure 1. LT8631 Efficiency vs Load Current

The LT8631 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this demo manual for demo circuit 2110A. The LT8631 is assembled in a 20-lead TSSOP packages. Proper board layout is essential for maximum thermal and electrical performance. See the data sheet sections for details.

Design files for this circuit board are available at http://www.linear.com/demo/DC2110A

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PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		6.5		100	V
V_{OUT}	Output Voltage		4.88	5.04	5.2	V
f_{SW}	Switching Frequency	R_T = 25.5kΩ	370	400	430	kHz
I_{OUT}	Max Output Current	V_{IN} = 12V	1			A
E_{FE}	Efficiency at DC	V_{IN} = 12V, I_{OUT} = 1A		82.6		%
		V_{IN} = 12V, I_{OUT} = 0.4A		89.5		%

QUICK START PROCEDURE

Demonstration circuit 2110A is easy to set up to evaluate the performance of the LT8631. Refer to Figure 3 for proper measurement equipment setup and follow the procedure below:

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} or V_{OUT} and GND terminals. See Figure 4 for the proper scope technique.

1. Place JP1 on GND position.
2. With power off, connect the input power supply to V_{EMI} and GND. If the EMI/EMC performance is not important, the input EMI filter can be bypassed by connecting the input power supply to V_{IN} and GND.
3. With power off, connect loads from V_{OUT} to GND.
4. Turn on the power at the input.

   Make sure that the input voltage does not exceed 100V.
5. Check for the proper output voltages (V_{OUT} = 5V).

   NOTE. If there is no output, temporarily disconnect the load to make sure that the load is not set too high or is shorted.
6. Once the proper output voltage is established, adjust the load within the operating ranges and observe the output voltage regulation, ripple voltage, efficiency and other parameters.
7. An external clock can be added to the SYNC terminal when SYNC function is used (JP1 on the SYNC position). Please ensure that the chosen RT sets the LT8631 switching frequency to 10% below the lowest SYNC frequency. See the data sheet Synchronization section for details.

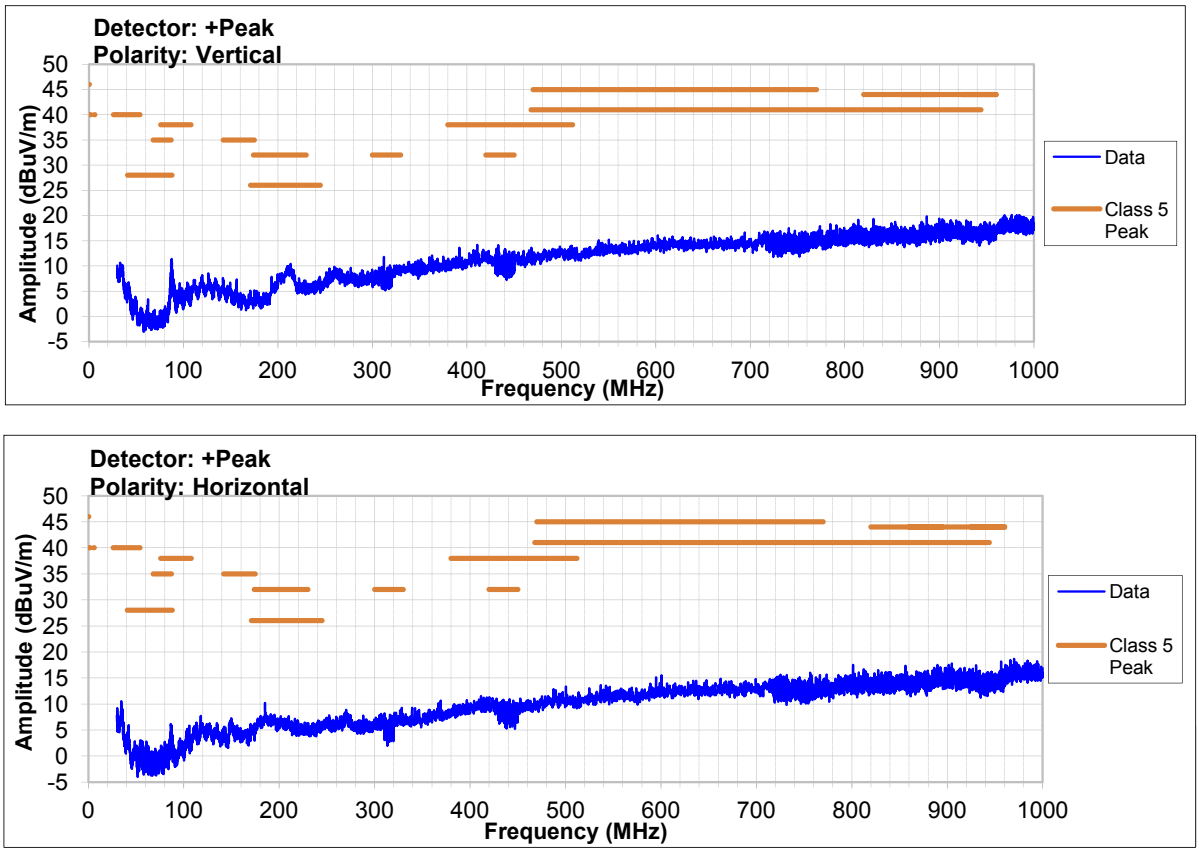


Figure 2. LT8631 Demo Circuit DC2110A EMI Performance in CISPR25 Radiated Emission Test (14V Input from V_{EMI} Turret Pin, I_{OUT} = 1A)

QUICK START PROCEDURE

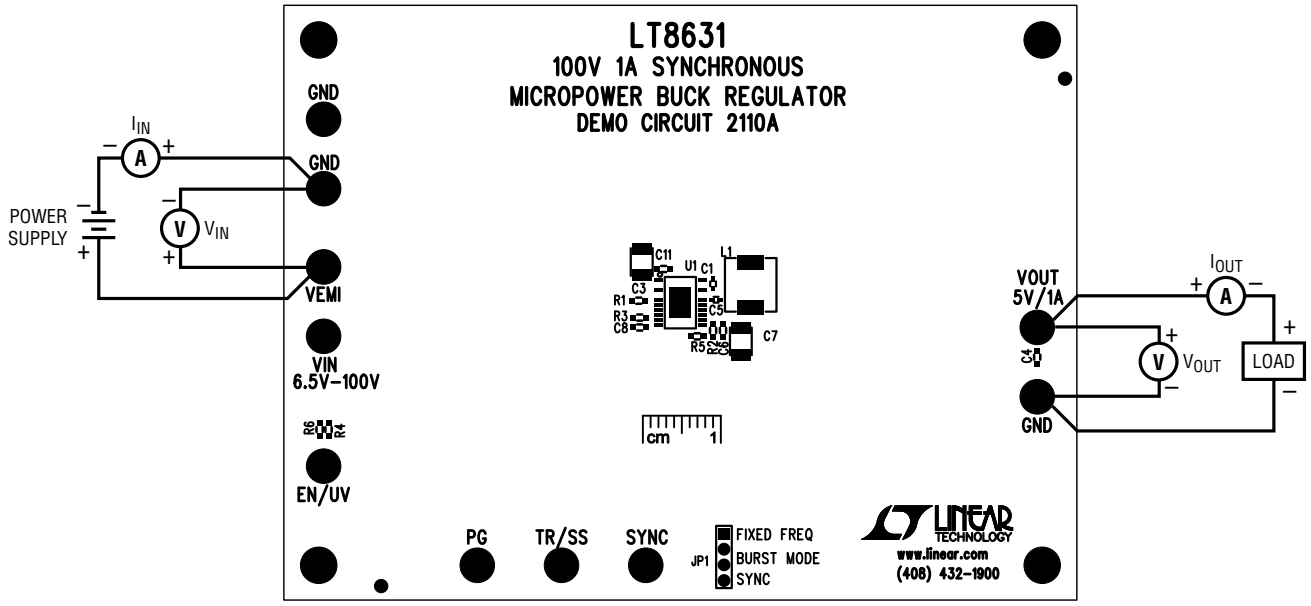


Figure 3. Proper Measurement Equipment Setup

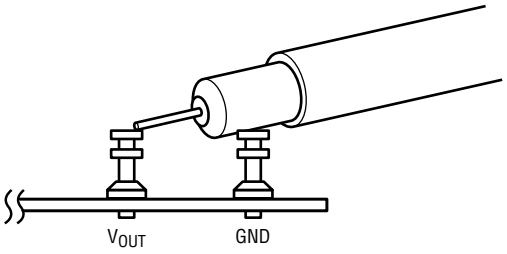
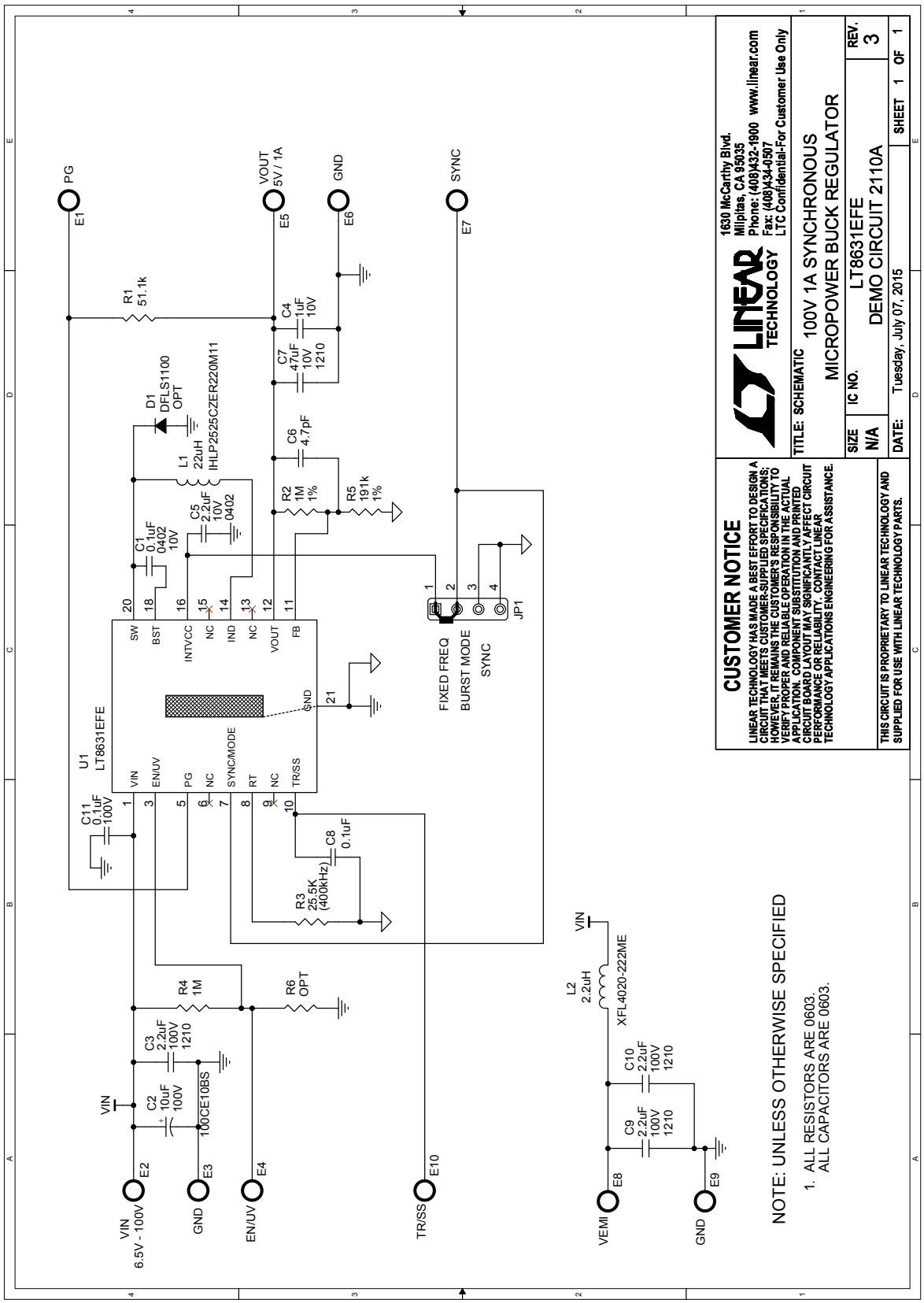


Figure 4. Measurement Input or Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, 0.1µF, X7R, 10V, 10% 0402	TDK, C1005X7R1A104K
2	1	C5	CAP, 2.2µF, X5R, 10V, 10% 0402	TDK, C1005X5R1A225K050BC
3	1	C6	CAP, 4.7pF, C0G, 50V, 0.25pF 0603	MURATA, GRM1885C1H4R7CA01D
4	1	C7	CAP, 47µF, X7R, 10V, 20% 1210	MURATA, GRM32ER71A476KE15L
5	1	C8	CAP, 0.1µF, X7R, 10V, 10% 0603	AVX, 0603ZC104KAT2A
6	1	C4	CAP, 1µF, X7R, 10V, 10% 0603	SAMSUNG, CL10B105KP8NNNC
7	1	L1	INDUCTOR, 22µH IHLP2525	VISHAY, IHLP2525CZER220M11
8	1	L2	INDUCTOR, 2.2µH	COILCRAFT, XFL4020-222MEB
9	1	R1	RES, 51.1k, 1/10W, 1% 0603	VISHAY, CRCW060351K1FKEA
10	2	R2, R4	RES, 1M, 1/10W, 1% 0603	VISHAY, CRCW06031M00FKEA
11	1	R3	RES, 25.5k, 1/10W, 1% 0603	VISHAY, CRCW060325K5FKEA
12	1	R5	RES, CHIP, 191k, 1/10W, 1% 0603	VISHAY, CRCW0603191KFKEA
13	1	U1	IC, BUCK REG FE-20(16) CB	LINEAR TECHNOLOGY, LT8631EFE#PBF
Additional Demo Board Circuit Components				
1	1	C2	CAP, ALUM, 10µF, 100V	SUN ELECTRONIC, 100CE10BS
2	0	C11 (OPT)	CAP, 0603	
3	0	D1 (OPT)	SCHOTTKY BARRIER REC, POWER-DI-123	
Hardware: For Demo Board Only				
1	10	E1 TO E10	TEST POINT, TURRET, 0.094" MTG.HOLE	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	4 PIN 0.079 SINGLE ROW HEADER	SULLIN, NRPN041PAEN-RC
3	1	XJP1	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G
4	0	R6 (OPT)	RES, 0603	
5	4	MH1 TO MH4	STAND-OFF, NYLON 0.50"	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



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