LT8630 100V, 0.6A Synchronous Micropower Step-Down High Efficiency Switching Regulator

DESCRIPTION

Demonstration circuit 2504A is a step-down converter featuring LT8630. The LT8630 is a monolithic, variable frequency, current mode synchronous step-down switching regulator. The demo board is designed for 12V output from a 13V to 100V input. The wide input range makes it suitable for regulating power from a variety of sources, including automotive, industrial systems and telecom supplies. The power switch, compensation and other necessary circuits are inside of the LT8630 to minimize external components and simplify design.

Variable frequency boundary mode switching maximizes efficiency across the wide input range. Figure 1 shows the efficiency of the demo board circuit with a 48V input. The LT8630 will deliver at least 600mA. The maximum output current depends on V_{IN}, V_{OUT} and the inductor value. Figure 2 shows the max load current at different input voltages of the demo board.

The LT8630 switching frequency during the boundary mode operation is determined by the inductor value, input voltage, output voltage and output current. The frequency versus the load current of the demo board at $48V_{IN}$ is given on Figure 3.

The demo board leaves the footprint of an EMI filter on the backside. Figure 4 shows the radiated EMI performance of the board when an EMI filter is installed on the board. The red line in Figure 4 is CISPR25 Class 5 peak limit. The figure shows that the circuit passes the test with a wide margin. The conducted EMI can be passed as well with the right design of the filter. When input EMI filter is required, the input voltage should be applied at V_{EMI}, not V_{IN}.

The LT8630 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 2504A. The LT8630 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/DC2504A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		13		100	V
V_{OUT}	Output Voltage		11.71	12.11	12.52	V
I_{OUT}	Max Output Current	V_{IN} = 48V, V_{OUT} = 12V, L = 22µH	0.6			A
E_{FE}	Efficiency at DC	V_{IN} = 48V, I_{OUT} = 0.6A		91		%

DESCRIPTION

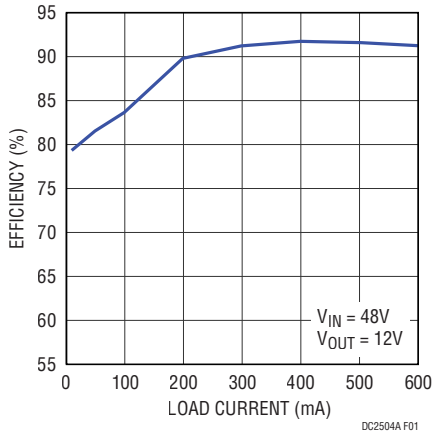


Figure 1. LT8630 Efficiency vs Load Current

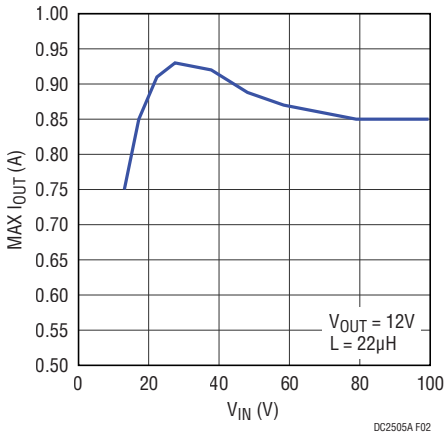


Figure 2. LT8630 Typical Maximum Load Current vs V_{IN}

DESCRIPTION

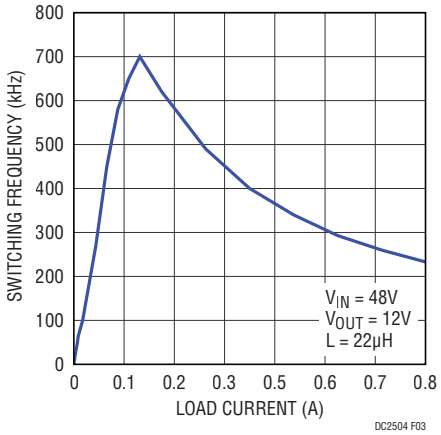


Figure 3. Switching Frequency vs Load Current

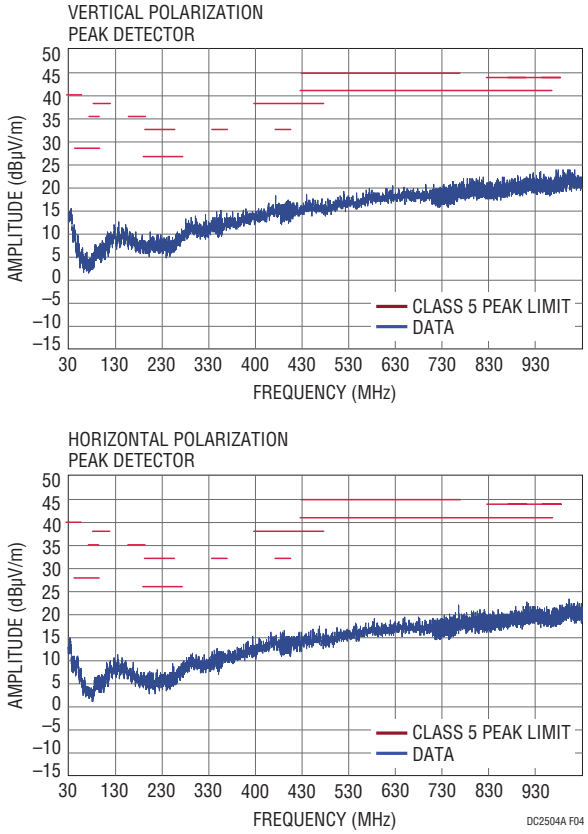


Figure 4. LT8630 Demo Circuit 2504A EMI Performance in CISPR25 Radiated Emission Test (48V Input from V_{EMI}, I_{OUT} = 0.6A)

QUICK START PROCEDURE

Demonstration circuit 2504A is easy to set up to evaluate the performance of the LT8630. Refer to Figure 5 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 5 for the proper scope technique.

1. With power off, connect the input power supply to V_{IN} and GND. If the EMI/EMC performance is required, the input EMI filter should be installed, and input power supply should be connected to V_{EMI} and GND.
2. With power off, connect loads from V_{OUT} to GND.
3. Turn on the power at the input.

   Make sure that the input voltage does not exceed 100V.
4. Check for the proper output voltages (V_{OUT} = 12V).

   Note. If there is no output, temporarily disconnect the load to make sure that the load is not set too high or is shorted.
5. 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.

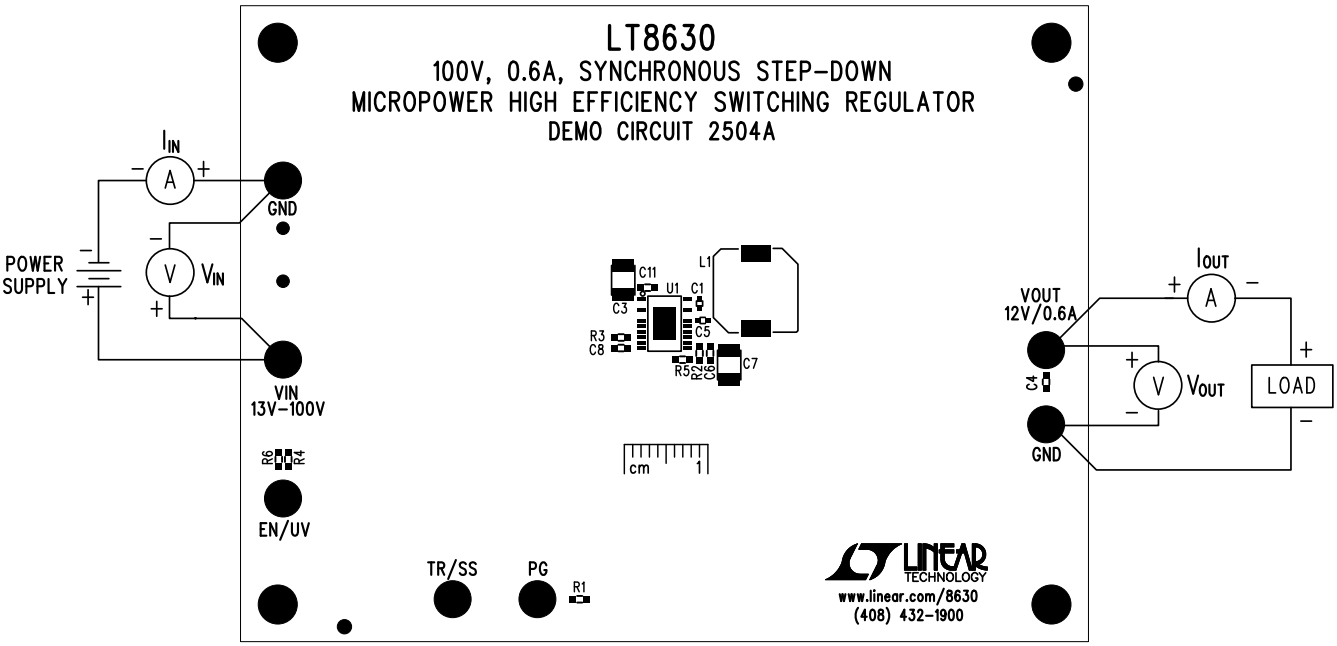


Figure 5. Proper Measurement Equipment Setup

QUICK START PROCEDURE

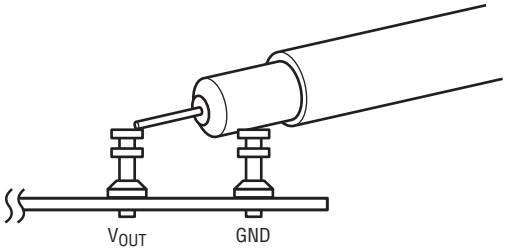
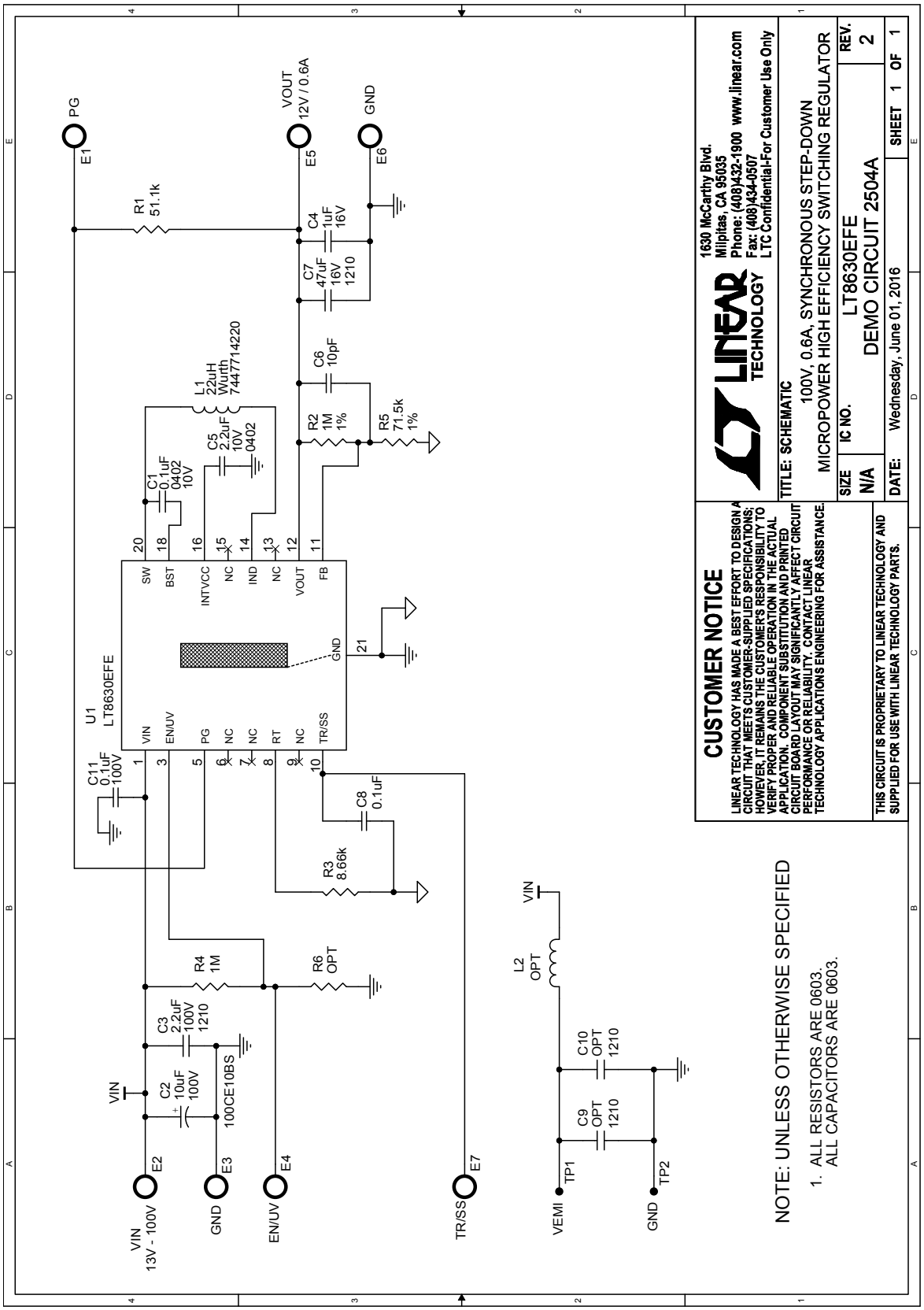


Figure 6. Measuring Input or Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Demo Board Circuit Components				
1	1	C1	CAP., X7R, 0.1µF, 10V, 10% 0402	TDK, C1005X7R1A104K050BB
2	1	C3	CAP., X7R, 2.2µF, 100V, 10% 1210	MURATA, GRM32ER72A225KA35L
3	1	C4	CAP., X7R, 1µF, 16V, 10% 0603	AVX, 0603YC105KAT2A
4	1	C5	CAP., X5R, 2.2µF, 10V, 10% 0402	TDK, C1005X5R1A225K050BC
5	1	C6	CAP., C0G, 10pF, 50V, 5% 0603	MURATA, GRM1885C1H100JA01D
6	1	C7	CAP., X5R, 47µF, 16V, 10% 1210	MURATA, GRM32ER61C476KE15K
7	1	C8	CAP., X7R, 0.1µF, 10V, 10% 0603	AVX, 0603ZC104KAT2A
8	1	C11	CAP., X7R, 0.1µF, 100V, 10% 0603	MURATA, GRM188R72A104KA35D
9	1	L1	INDUCTOR, 22µH, 7447714220	WURTH ELEKTRONIK, 7447714220
10	1	R1	RES., CHIP, 51.1k, 1/10W, 1% 0603	VISHAY, CRCW060351K1FKEA
11	2	R2, R4	RES., CHIP, 1mΩ, 1/10W, 1% 0603	VISHAY, CRCW06031M00FKEA
12	1	R3	RES., CHIP, 8.66k, 1/10W, 1% 0603	VISHAY, CRCW06038K66FKEA
13	1	R5	RES., CHIP, 71.5k, 1/10W, 1% 0603	VISHAY, CRCW060371K5FKEA
14	1	U1	I.C., BUCK REG. FE-20(16)CB	LINEAR TECH. CORP., LT8630EFE#PBF
Additional Demo Board Circuit Components				
1	1	C2	CAP., ALUM, 10µF, 100V	SUN ELECTRONIC, 100CE10BS
2	0	C9, C10 (OPT)	CAP., OPTION, 1210	
3	0	L2 (OPT)	INDUCTOR, OPTION	
4	0	R6 (OPT)	RES., OPTION, 0603	
Hardware/Components (for Demo Board Only)				
1	7	E1-E7	TESTPOINT, TURRET, 0.094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
2	4	MH1-MH4	STAND-OFF, NYLON, 0.50"	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



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