LT8608/LT8608B 42V, 1.5A Micropower Synchronous Step-Down Regulator

DESCRIPTION

Demonstration circuit 2521A is a 42V, 1.5A micropower synchronous step-down regulator featuring the LT8608/LT8608B. There are two assembly versions. DC2521A-A is for the LT8608 and DC2521A-B is for the LT8608B.

The LT8608/LT8608B is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator. Top and bottom power switches, compensation components and other necessary circuits are inside of the 2mm × 2mm DFN package to minimize external components and simplify design. The difference LT8608 and LT8608B is the LT8608 works under low ripple Burst Mode® operation at light load condition, while the LT8608B has pulse-skipping mode for light load. Due to the Burst Mode operation, LT8608 consumes only 1.7µA of quiescent current when output is regulated at 5V. LT8608B has higher quiescent current because of its pulse-skipping mode operation.

The demo board is designed for 5V output from a 5.5V to 42V input. The wide input range allows a variety of input sources, such as automotive batteries and industrial supplies.

The demo board has an EMI filter installed. The radiated EMI performances of the board (with EMI filter) are shown in Figure 2 and Figure 3. The red lines in Figure 2 and Figure 3 are CISPR 25 Class 5 peak limit. To use the EMI filter, the input should be tied to V_{EMI}, not V_{IN}. An inductor L2, which is a 0Ω jumper on the board by default now, can be added in the EMI filter to further reduce the conducted emission.

The LT8608 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 DC2521A.

Design files for this circuit board are available.

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PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Voltage Range		5.5		42	V
V_{OUT}	Output Voltage		4.8	5	5.2	V
I_{OUT}	Maximum Output Current		1.5			A
f_{SW}	Switching Frequency		1.85	2	2.15	MHz
EFE	Efficiency at DC	V_{IN} = 12V, I_{OUT} = 0.75A		92		%

QUICK START PROCEDURE

DC2521A is easy to set up to evaluate the performance of the LT8608/LT8608B. Refer to Figure 4 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. See Figure 5 for the proper scope technique.

1. Set an input power supply that is capable of 42V/1.5A. Then turn off the supply.
2. With power off, connect the supply to the input terminals V_{IN} and GND.
3. Turn on the power at the input.

   NOTE: Make sure that the input voltage never exceeds 42V.
4. Check for the proper output voltage of 5V. Turn off the power at the input.
5. Once the proper output voltage is established, connect a variable load capable of sinking 1.5A at 5V to the output terminals V_{OUT} and GND. Set the current for 0A.
   a. If efficiency measurements are desired, an ammeter can be put in series with the output load in order to measure the DC2521A's output current.
   b. A voltmeter can be placed across the output terminals in order to get an accurate output voltage measurement.
6. Turn on the power at the input.

   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
7. Once the proper output voltage is established again, adjust the load and/or input within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other desired parameters.

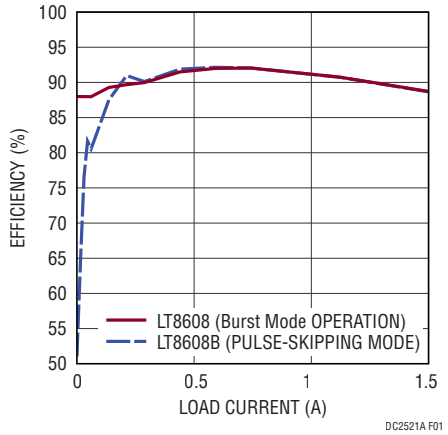


Figure 1. Efficiency vs Load Current at 12V Input and 2MHz Switching Frequency

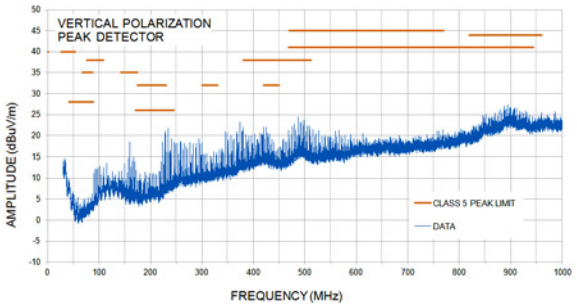


Figure 2. LT8608/LT8608B Demo Circuit EMI Performance in CISPR 25 Radiated Emission Test, Antenna Polarization: Vertical (V_{IN} = 14V, V_{OUT} = 5V, I_{OUT} = 1.5A, 2MHz Switching Frequency)

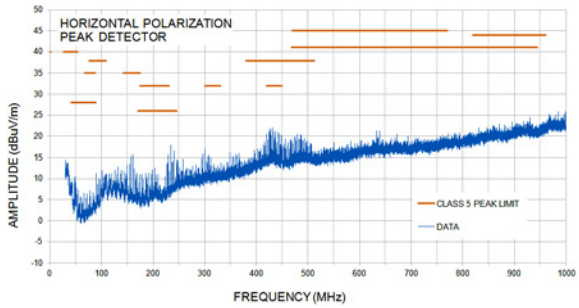


Figure 3. LT8608/LT8608B Demo Circuit EMI Performance in CISPR 25 Radiated Emission Test, Antenna Polarization: Horizontal (V_{IN} = 14V, V_{OUT} = 5V, I_{OUT} = 1.5A, 2MHz Switching Frequency)

QUICK START PROCEDURE

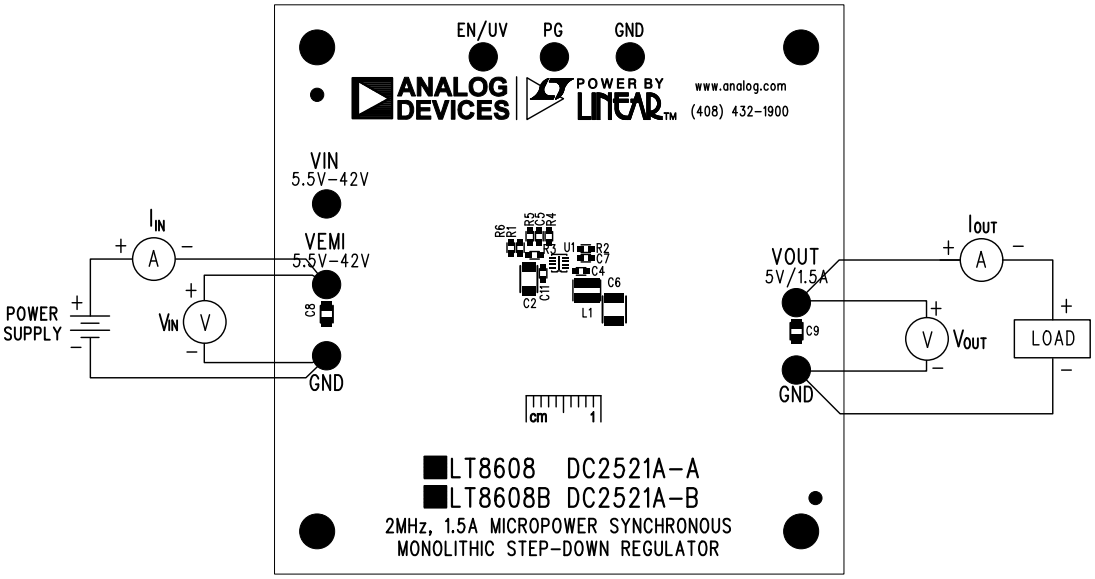


Figure 4. Proper Measurement Equipment Setup

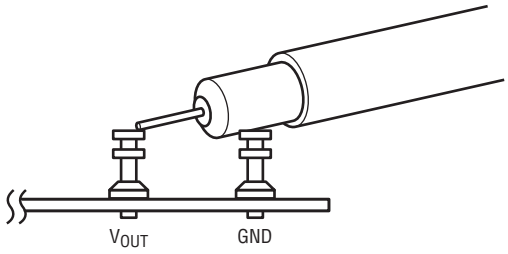
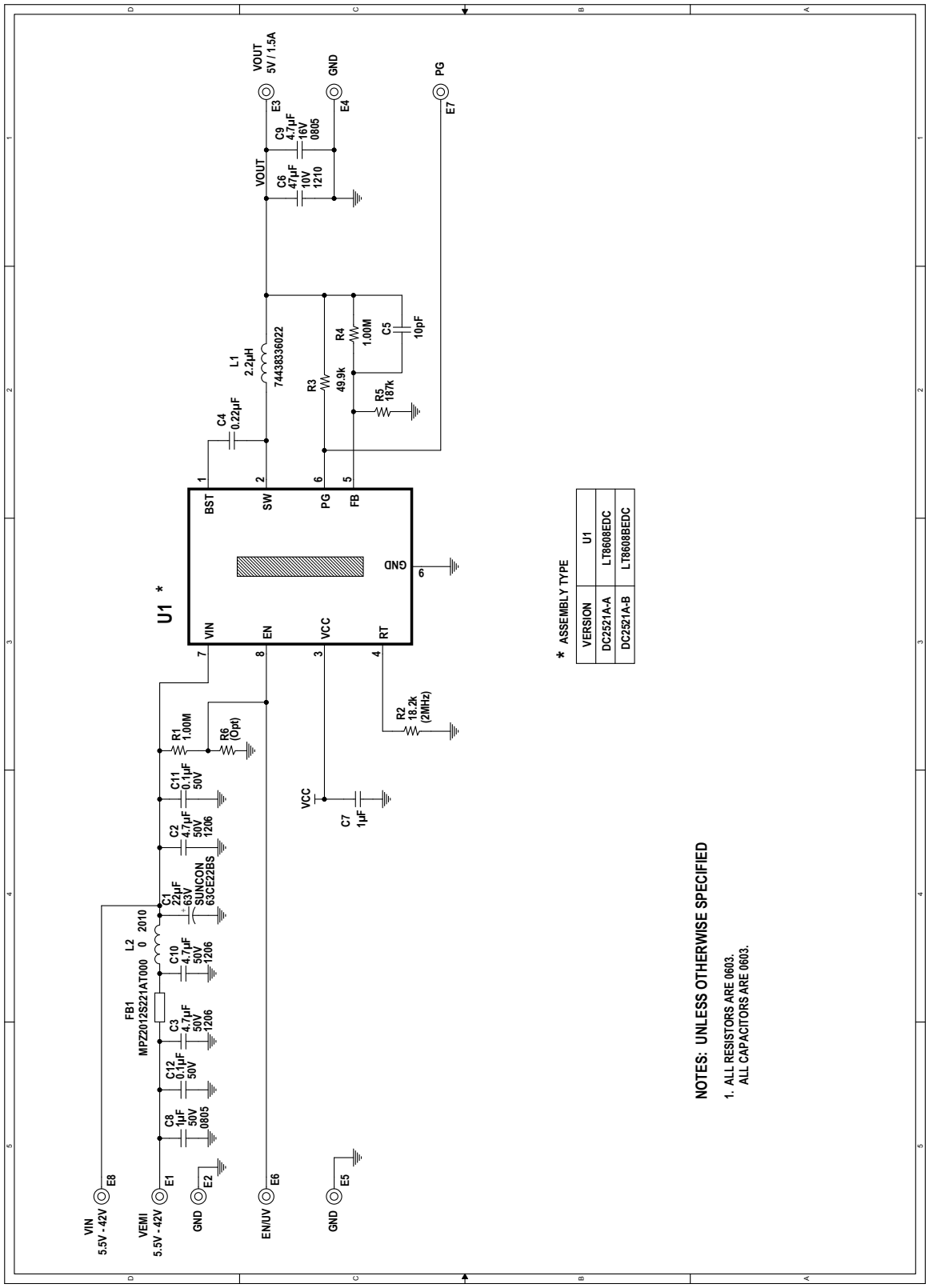


Figure 5. Measuring Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C2	CAP., X7R, 4.7µF, 50V, 10% 1206	MURATA, GRM31CR71H475K
2	1	C4	CAP., X7R, 0.22µF, 16V, 10%, 0603	AVX, 0603YC224KAT2A
3	1	C5	CAP., C0G, 10pF, 25V, 5%, 0603	AVX, 06033A100JAT2A
4	1	C6	CAP., X7R, 47µF, 10V, 10%, 1210	MURATA, GRM32ER71A476KE20L
5	1	C7	CAP., X7R, 1.0µF, 25V, 10%, 0603	MURATA, GRM188R71E105KA12D
6	1	L1	IND., 2.2µH	WURTH ELEKTRONIK, 74438336022
7	1	R2	RES., CHIP, 18.2k, 1/10W, 1%, 0603	VISHAY, CRCW060318K2FKEA
8	1	R3	RES., CHIP, 49.9k, 1/10W, 1%, 0603	VISHAY, CRCW060349K9FKEA
9	2	R1, R4	RES., CHIP, 1MEG, 1/10W, 1%, 0603	VISHAY, CRCW06031M00FKEA
10	1	R5	RES., CHIP, 187k, 1/10W, 1%, 0603	VISHAY, CRCW0603187KFKEA
DC2521A-A Version Specific Components				
1	1	U1	IC, REGULATOR, DFN-8	ANALOG DEVICES, LT8608EDC#PBF
DC2521A-B Version Specific Components				
1	1	U1	IC, REGULATOR, DFN-8	ANALOG DEVICES, LT8608BEDC#PBF
Additional Demo Board Circuit Components				
1	1	C1	CAP., ALUM 22µF 63V	SUN ELECT, 63CE22BS
2	2	C3, C10	CAP., X7R, 4.7µF, 50V, 10% 1206	MURATA, GRM31CR71H475K
3	1	C8	CAP., X7R, 1µF, 50V, 10%, 0805	TDK, C2012X7R1H105K
4	1	C9	CAP., X7R, 4.7µF, 16V, 10%, 0805	MURATA, GRM21BR71C475K73L
5	2	C11, C12	CAP., X7R, 0.1µF, 50V, 10%, 0603	MURATA, GRM188R71H104KA93D
6	1	FB1	FERRITE BEAD 0805	TDK, MPZ2012S221AT000
7	1	L2	RES., CHIP, 0Ω, 3/4W, 2010	VISHAY, CRCW20100000Z0EF
8	0	R6 (OPT.)	RES., 0603	
Hardware For Demo Board Only				
1	7	E1 – E7	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	E8 (OPT.)	TESTPOINT, TURRET, 0.094"	
3	4	MH1 – MH4	STAND-OFF, NYLON 0.50 TALL	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



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