LT8612

42V, 6A Micropower Synchronous Step-Down Regulator

DESCRIPTION

Demonstration circuit 2010A is a 42V, 6A micropower synchronous step-down regulator featuring the LT®8612. The demo board is designed for 5V output from a 5.8V to 42V input. The wide input range allows a variety of input sources, such as automotive batteries and industrial supplies. The LT8612 is a compact, high efficiency, and high speed synchronous monolithic step-down switching regulator. The integrated power switches and inclusion of all necessary circuitry reduce the components count and solution size. Ultralow 3μA quiescent current in Burst Mode® operation achieves high efficiency at very light loads. Fast minimum on-time of 40ns enables high V_{IN} to low V_{OUT} conversion at high frequency.

The LT8612 switching frequency can be programmed either via oscillator resistor or external clock over a 200kHz to 2.2MHz range. The SYNC pin on the demo board is grounded 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. Once JP1 is on SYNC position, a DC voltage of 3V or higher can be applied to the SYNC turret for pulse-skipping operation.

Figure 1 shows the efficiency of DC2010A circuit at 12V input. Figure 2 shows the LT8612 temperature rising on DC2010A demo board under different load conditions. The rated maximum load current is 6A, while derating is necessary for certain V_{IN} and thermal conditions. The demo board has an EMI filter installed. To use the EMI filter, the input should be tied to VEMI terminal, not VIN terminal.

The LT8612 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 2010A. The LT8612 is assembled in a 3mm × 6mm plastic QFN package with exposed pads for low thermal resistance. Proper board layout is essential for minimum EMI and maximum thermal performance. See the data sheet section PCB Layout and High Temperature Considerations.

Design files for this circuit board are available at http://www.linear.com/demo/DC2010A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		5.8		42	V
V_{OUT}	Output Voltage		4.875	5	5.125	V
I_{OUT}	Maximum Output Current	Derating Is Necessary for Certain V_{IN} and Thermal Conditions	6			A
f_{SW}	Switching Frequency		665	700	735	kHz
EFE	Efficiency at DC	V_{IN} = 12V , I_{OUT} = 3A		94.3		%

DESCRIPTION

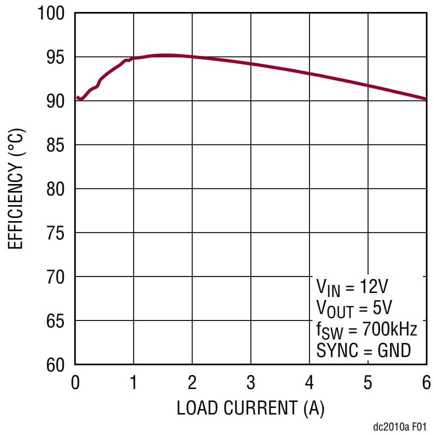


Figure 1. Efficiency vs Load Current (Using VIN Terminal)

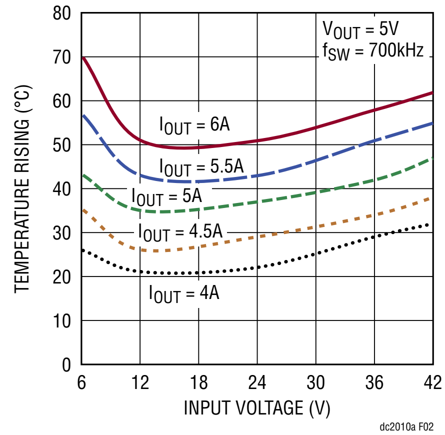


Figure 2. Temperature Rising vs Input Voltage

QUICK START PROCEDURE

Demonstration circuit 2010A is easy to set up to evaluate the performance of the LT8612. 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 VIN or VOUT 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 VIN and GND.
3. With power off, connect the load from VOUT to GND.
4. Turn on the power at the input.

   NOTE. Make sure that the input voltage does not exceed 42V.

5. Check for the proper output voltage (VOUT = 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 make sure that R_T should be chosen to set the LT8612 switching frequency equal to or below the lowest SYNC frequency. See the data sheet section Synchronization.

QUICK START PROCEDURE

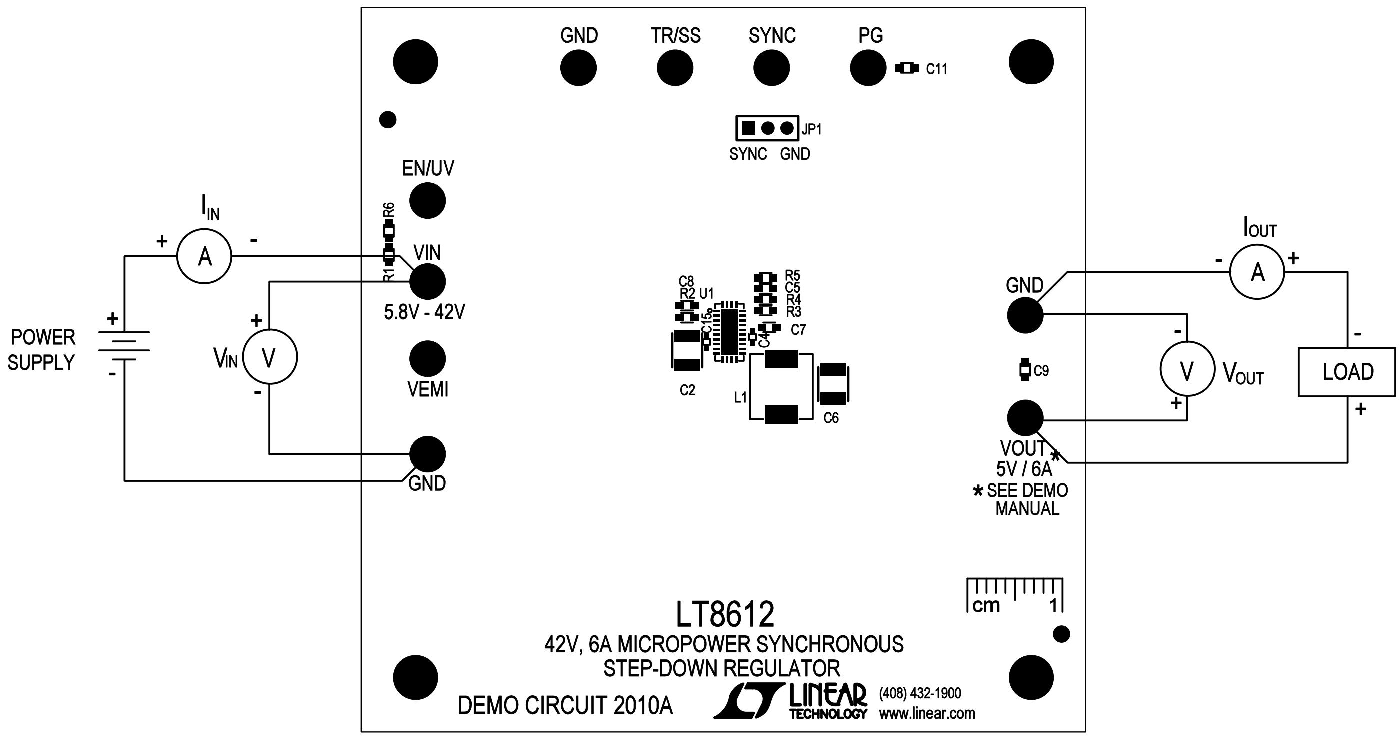


Figure 3. Proper Measurement Equipment Setup

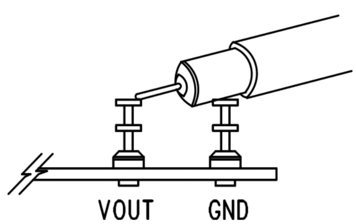
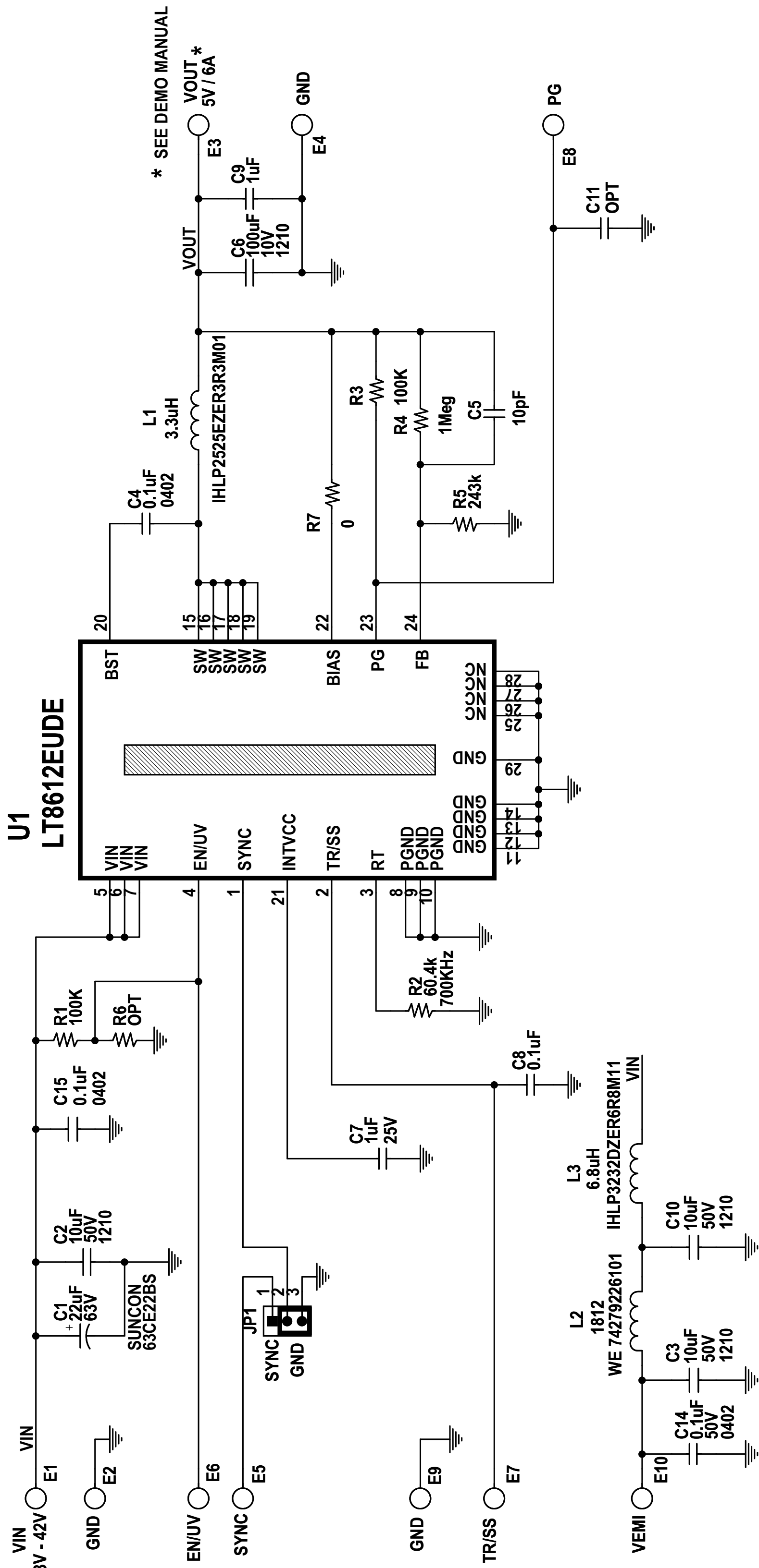


Figure 4. Measuring Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C2	CAP., X5R, 10µF, 50V, 10% 1210	MURATA, GRM32ER61H106KA12L
2	1	C8	CAP., X7R, 0.1µF, 25V, 10% 0603	MURATA, GRM188R71E104KA01D
3	1	C5	CAP., C0G, 10pF, 25V, 5% 0603	AVX, 06033A100JAT2A
4	1	C6	CAP., X5R, 100µF, 10V, 20% 1210	SAMSUNG, CL32A107MPVNNNE
5	2	C7, C9	CAP., X7R, 1.0µF, 25V, 10% 0603	MURATA, GRM188R71E105KA12D
6	2	C4, C15	CAP., X7R, 0.1µF, 50V, 10% 0402	TDK, C1005X7R1H104K
7	1	L1	IND., 3.3µH, IHLP2525EZ-01	VISHAY, IHLP2525EZER3R3M01
8	2	R1, R3	RES., CHIP., 100k, 1/10W, 1% 0603	VISHAY, CRCW0603100KFKEA
9	1	R2	RES., CHIP., 60.4k, 1/10W, 1% 0603	VISHAY, CRCW060360K4FKEA
10	1	R4	RES., CHIP., 1M, 1/10W, 1% 0603	VISHAY, CRCW06031M00FKEA
11	1	R5	RES., CHIP., 243k, 1/10W, 1%, 0603	VISHAY, CRCW0603243KFKEA
12	1	U1	IC, REGULATOR, 28-QFN, UDE	LINEAR TECH., LT8612EUDE#PBF
Additional Demo Board Circuit Components				
1	1	C1	CAP., ALUM 22µF, 63V	SUN ELECT., 63CE22BS
2	2	C3, C10	CAP., X5R, 10µF, 50V, 10% 1210	MURATA, GRM32ER61H106KA12L
3	1	C14	CAP., X7R, 0.1µF, 50V, 10% 0402	TDK, C1005X7R1H104K
4	0	C11 (OPT)	CAP., 0603	
5	1	L2	FERRITE BEAD 100Ω 8A SMD 1812	WURTH, 74279226101
6	1	L3	IND., 6.8µH, IHLP3232DZ-11	VISHAY, IHLP3232DZER6R8M11
7	0	R6 (OPT)	RES., 0402	
8	1	R7	RES., CHIP., 0Ω, 1/10W, 1%, 0603	VISHAY, CRCW06030000Z0EA
Hardware: For Demo Board Only				
1	10	E1-E10	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	HEADER, 3 PIN 0.079" SINGLE ROW	SULLINS, NRPN031PAEN-RC
3	1	XJP1	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G
4	4	MH1-MH4	STAND-OFF, NYLON 0.50" TALL	KEYSTONE, 8833(SNAP ON)

SCHEMATIC DIAGRAM



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 0603.
   ALL CAPACITORS ARE 0603.

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