LT8619
60V, 1.2A Synchronous Monolithic Buck Regulator with 6µA Quiescent Current

DESCRIPTION

Demonstration circuit 2137A is a monolithic step-down DC/DC switching regulator featuring the LT®8619. The LT8619 is a high efficiency, high speed synchronous monolithic step-down switching regulator that consumes only 6µA of quiescent current. The demo circuit is designed for 5V, 1.2A output from 6V to 48V input with the transient input voltage up to 60V. The wide input range makes it suitable for regulating power from a wide variety of sources, including automotive, industrial systems and telecom supplies. The power switch, compensation and other necessary circuits are inside of the LT8619 to minimize external components and simplify design.

The LT8619 switching frequency can be programmed either via oscillator resistor or external clock over a 300kHz to 2.2MHz range. The default frequency of demo circuit 2137A is 2MHz. The SYNC pin on the demo board is grounded (JP1 at BURST 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 terminal. The R_T resistor (R4) should be chosen to set the LT8619 internal switching frequency equal or below the lowest synchronization input. During clock synchronization, the controller enters forced continuous mode. Pulse-skipping mode and forced continuous mode can be selected respectively by moving JP1 shunt.

Low ripple Burst Mode operation increases the efficiency at the light load while keeping the output ripple low. Figure 1 shows the efficiency of the circuit at 12V and 24V input in Burst Mode operation (input from V_{IN} terminal to bypass the EMI filter).

The demo board has an EMI filter installed. The EMI performance of the board (with EMI filter) is shown on Figure 2. The red line in Radiated EMI Performance 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} terminal.

The LT8619 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 2137A. The LT8619 is assembled in a small 16-lead MSOP and 10-lead 3mm × 3mm DFN packages with exposed pad. Proper board layout is essential for both low EMI operation and maximum thermal performance. See the data sheet sections for details.

Design files for this circuit board are available at http://www.linear.com/demo/DC2137A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		3		60	V
V_{OUT}	Output Voltage		4.875	5	5.125	V
f_{SW}	Switching Frequency	R_T = 20kΩ	1.9	2	2.1	MHz
I_{OUT}	Max Output Current		1.2			A
EFE	Efficiency at DC	V_{IN} = 12V, I_{OUT} = 1.2A		87.1		%

DESCRIPTION

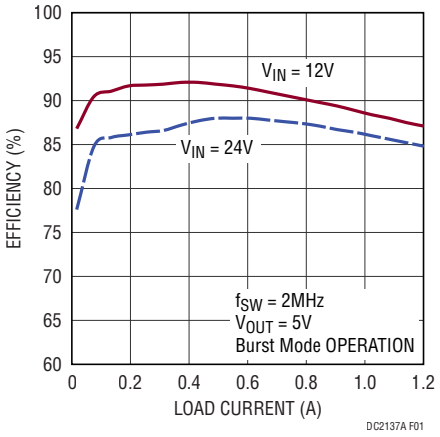


Figure 1. LT8619 DC2137A Efficiency vs Load Current

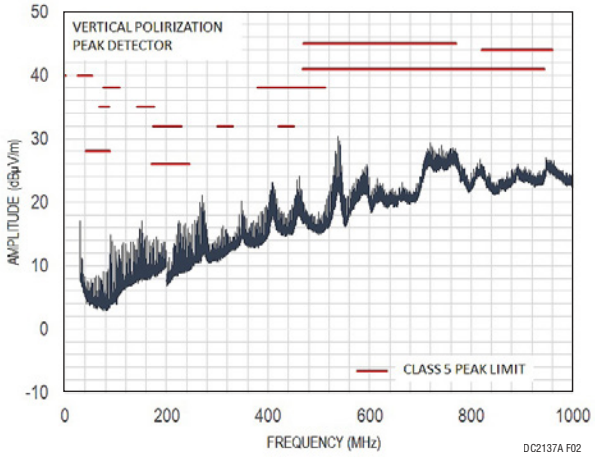


Figure 2. LT8619 DC2137A EMI Performance in CISPR25 Radiated Emission Test (12V Input from V_{EMI} Turret Pin, I_{OUT} = 1A)

QUICK START PROCEDURE

Demonstration circuit 2137A is easy to set up to evaluate the performance of the LT8619. 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 the Burst Mode operation position.
2. With power off, connect the input power supply to V_{IN1} and GND. Make sure that the input voltage does not exceed 60V.
3. With power off, connect loads from V_{OUT} to GND.
4. Turn on the power at the input.
5. Check for the proper output voltage (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 voltages are 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/MODE position). Please make sure that R4 should be chosen to set the LT8619 switching frequency equal to or below the lowest SYNC frequency. See the data sheet Synchronization section. JP1 can also set LT8619 in pulse-skipping mode (JP1 on the PULSE-SKIPPING position) or forced continuous mode (JP1 on the FORCED CONTINUOUS position).

Quick Start Procedure

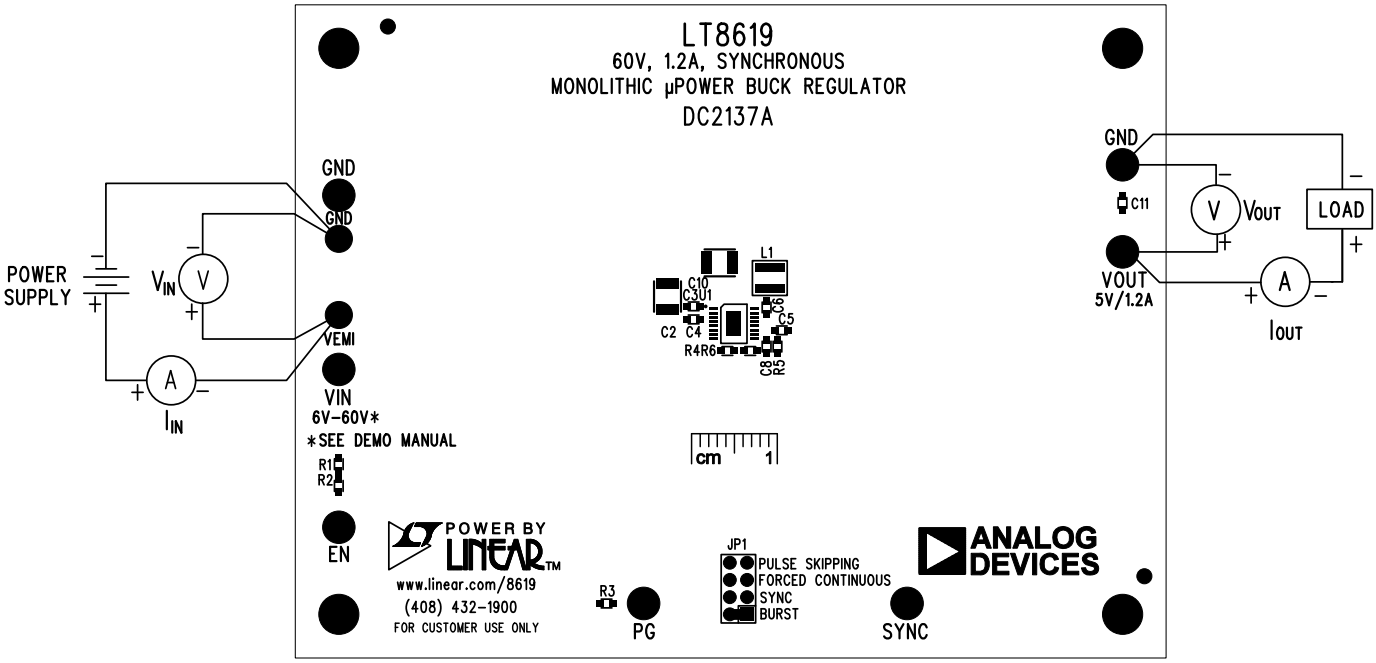


Figure 3. Proper Measurement Equipment Setup

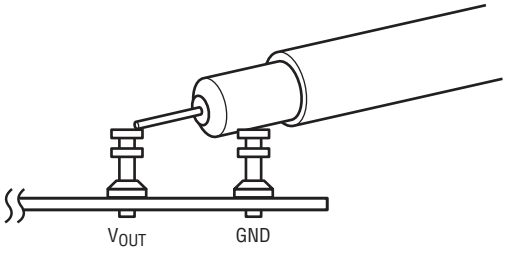
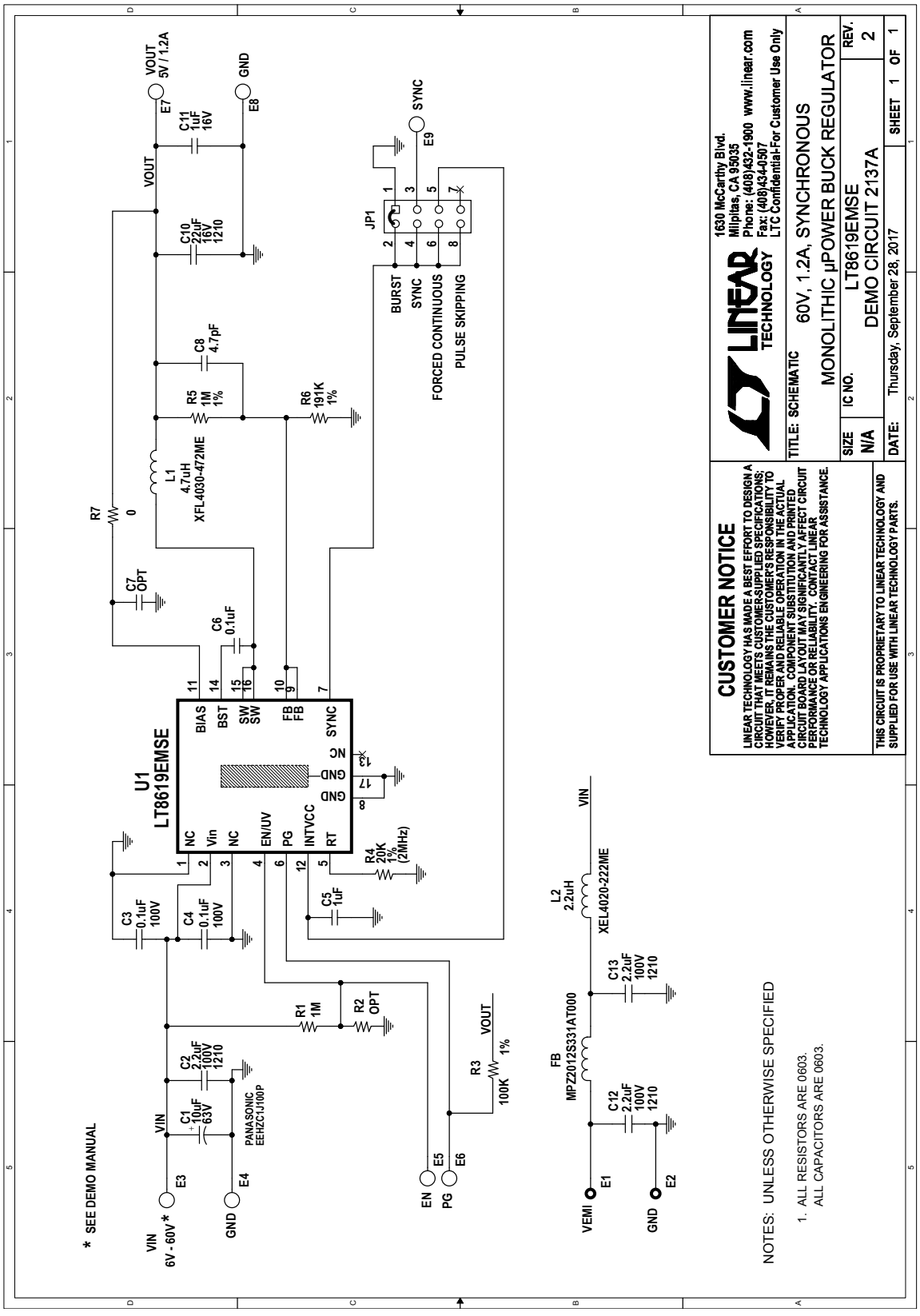


Figure 4. Measuring Input or Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Demo Board Circuit Components				
1	1	C2	CAP., X7R, 2.2µF, 100V, 10% 1210	TDK, C3225X7R2A225K230AB
2	2	C5, C11	CAP., X7R, 1µF, 25V, 10% 0603	TDK, C1608X7R1E105K080AB
3	1	C6	CAP., X7R, 0.1µF, 25V, 10%, 0603	TDK, C1608X7R1E104K080AA
4	1	C8	CAP., C0G, 4.7pF, 50V, ±0.25pF, 0603	MURATA, GRM1885C1H4R7CA01D
5	1	C10	CAP., X7R, 22µF, 16V, 10% 1210	MURATA, GRM32ER71C226KE18L
6	1	L1	IND., 4.7µH, XFL4030	COILCRAFT, XFL4030-472ME
7	2	R1, R5	RES., CHIP, 1M, 1/10W, 1% 0603	VISHAY, CRCW06031M00FKEA
8	1	R3	RES., CHIP, 100k, 1/10W, 1% 0603	VISHAY, CRCW0603100KFKEA
9	1	R4	RES., CHIP, 20k, 1/10W, 1% 0603	VISHAY, CRCW060320K0FKEA
10	1	R6	RES., CHIP, 191k, 1/10W, 1% 0603	VISHAY, CRCW0603191KFKEA
11	1	R7	RES., CHIP, 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
12	1	U1	I.C., BUCK REGULATOR, MSOP-16E	ANALOG DEVICES, LT8619EMSE#PBF
Additional Demo Board Circuit Components				
1	2	C12, 13	CAP., X7R, 2.2µF, 100V, 10% 1210	TDK, C3225X7R2A225K230AB
2	2	C3, C4	CAP., X7R, 0.1µF, 100V, 10% 0603	MURATA, GRM188R72A104KA35D
3	1	C1	CAP., ALUM. ELECTRO., 10µF, 63V	PANASONIC, EEHZC1J100P
4	1	FB	BEAD, 330Ω, MPZ2012	TDK, MPZ2012S331AT000
5	1	L2	IND., 2.2µH, XEL4020	COILCRAFT, XEL4020-222ME
6	0	C7	CAP., 0603 (OPT)	
7	0	R2	RES., CHIP, 0603 (OPT)	
Hardware/Components (for Demo Board Only)				
1	2	E1, E2	TESTPOINT, TURRET, 0.061" PBF	MILL-MAX, 2308-2-00-80-00-00-07-0
2	7	E3-E9	TESTPOINT, TURRET, 0.094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
3	1	JP1	0.079 × 4 DOUBLE ROW HEADER	WURTH ELEKTRONIK, 62000821121
4	1	XJP1	SHUNT, 0.079" CENTER	WURTH ELEKTRONIK, 60800213421

SCHEMATIC DIAGRAM



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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