

LT8604C

High Efficiency 42V, 120mA Synchronous Buck Regulator

DESCRIPTION

Demonstration circuit 2867A features the **LT®8604C**, a high efficiency 42V, 120mA synchronous step-down regulator in 12-Lead 2mm × 2mm LQFN package. The demo board is designed for 120mA at 5V output from a 5.8V to 42V input, with the switching frequency programmed at 2MHz. The wide input range allows a variety of input sources, such as automotive batteries and industrial supplies.

The LT8604C is a compact high efficiency, and high frequency synchronous monolithic step-down switching regulator, with soft-start capacitor, compensation network, BST and INTV_{CC} capacitors, all packed into a 2mm by 2mm package.

The switching frequency can be programmed via an oscillator resistor over a wide range from 200kHz to 2.2MHz, or sync to external clock through SYNC/MODE pin. Peak current mode control with minimum on-time of as small as 35ns allows high step-down conversion even at high frequency.

The operation mode can be configured via the SYNC/MODE pin for forced continuous mode, Burst Mode® operation, or spread spectrum mode. While in Burst Mode

operation, the current limit of the LT8604C top switch is approximately 215mA. The switching frequency will be far lower than the RT programmed frequency, and correspondingly much higher efficiency over wide loads ranges.

The low quiescent current and high efficiency in Burst Mode make it an ideal solution for applications requiring highest efficiency at very light load conditions, such as automotive housekeeping supplies, industrial sensors, flow meters, Internet of Things, and battery powered portable instruments.

The demo board 2867A has an EMI filter installed. The EMI performance of the board running in SSFM mode is shown in Figure 2, where the red lines are CISPR25 Class 5 average limits. The circuit passes the average limit with a wide margin.

The LT8604/LT8604C 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. Contact ADI applications engineer for technical support.

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 Supply Range		5.8		42	V
V _{OUT}	Output Voltage		4.85	5	5.15	V
I _{OUT}	Maximum Output Current		120			mA
f _{SW}	Switching Frequency, FCM	V _{IN} = 12V, I _{OUT} = 120mA	1.85	2	2.15	MHz
EFF	Efficiency, FCM	V _{IN} = 12V, I _{OUT} = 120mA		90		%

QUICK START PROCEDURE

Demonstration circuit 2867A is easy to set up to evaluate the performance of the LT8604C. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the DC power supply to VEMI or VIN and GND, and load from VOUT to GND.
2. By default, JP1 should be connected to VOUT. If it is not connected to any other supply, it should be tied to GND.
3. Turn on the power at the input. Make sure that the input voltage does not exceed 42V, and the load current does not exceed 120mA.
4. Check for the proper output voltage (5V). If there is no output, temporarily disconnect the load to make sure that the load is not set too high or the output terminal VOUT is shorted to ground.
5. Once the proper output voltage is established, adjust the load within the operating ranges and observe the output voltage regulation, ripple voltage, load transient, efficiency, and other parameters.

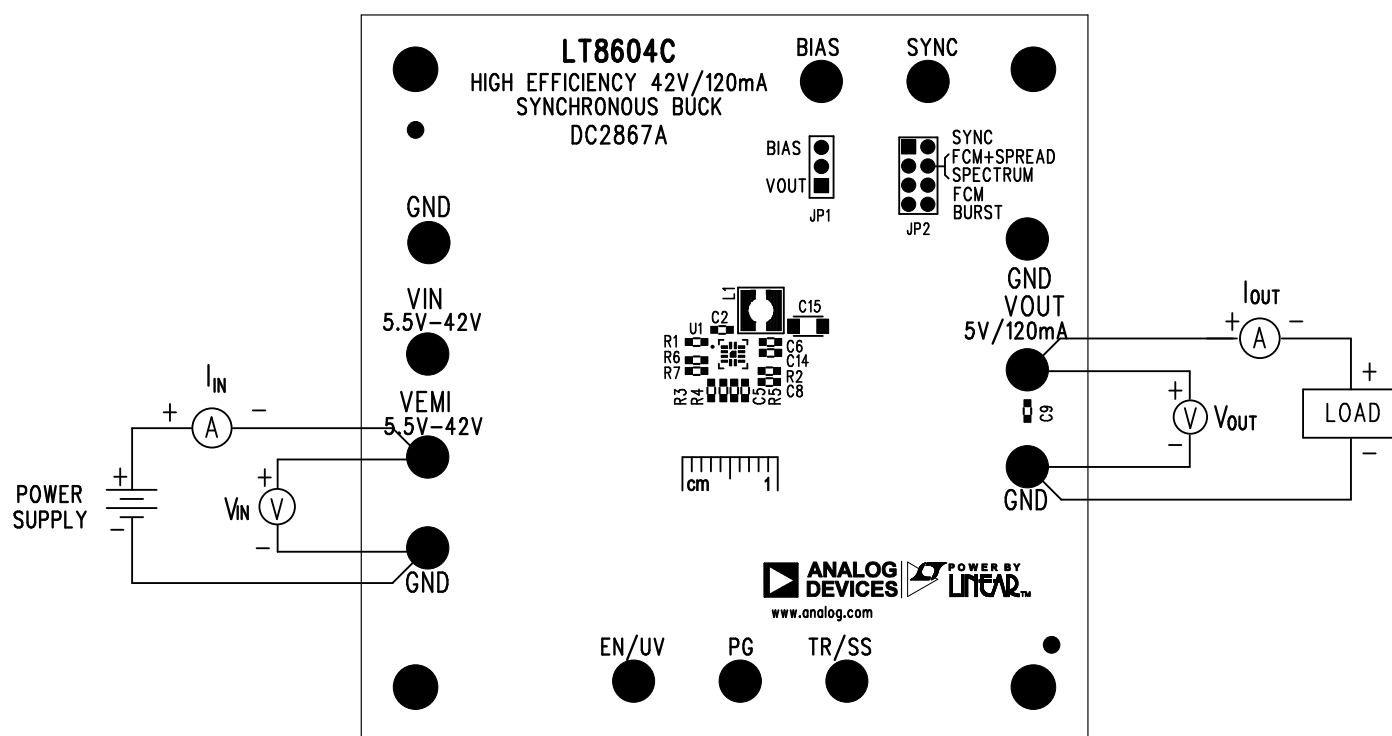


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

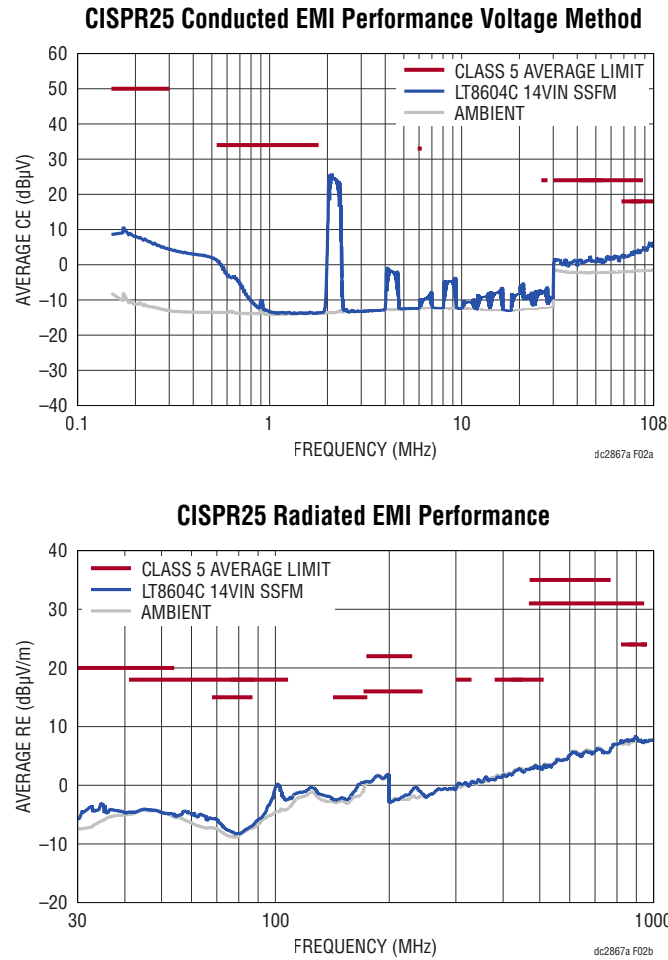


Figure 2. Conducted and Radiated EMI Performance of the DC2867A. $V_{IN} = 14V$, $I_{OUT} = 120mA$

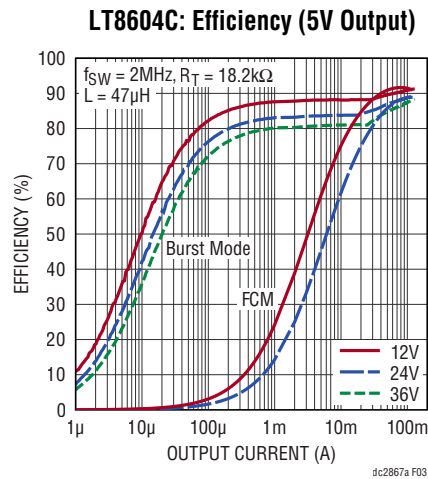


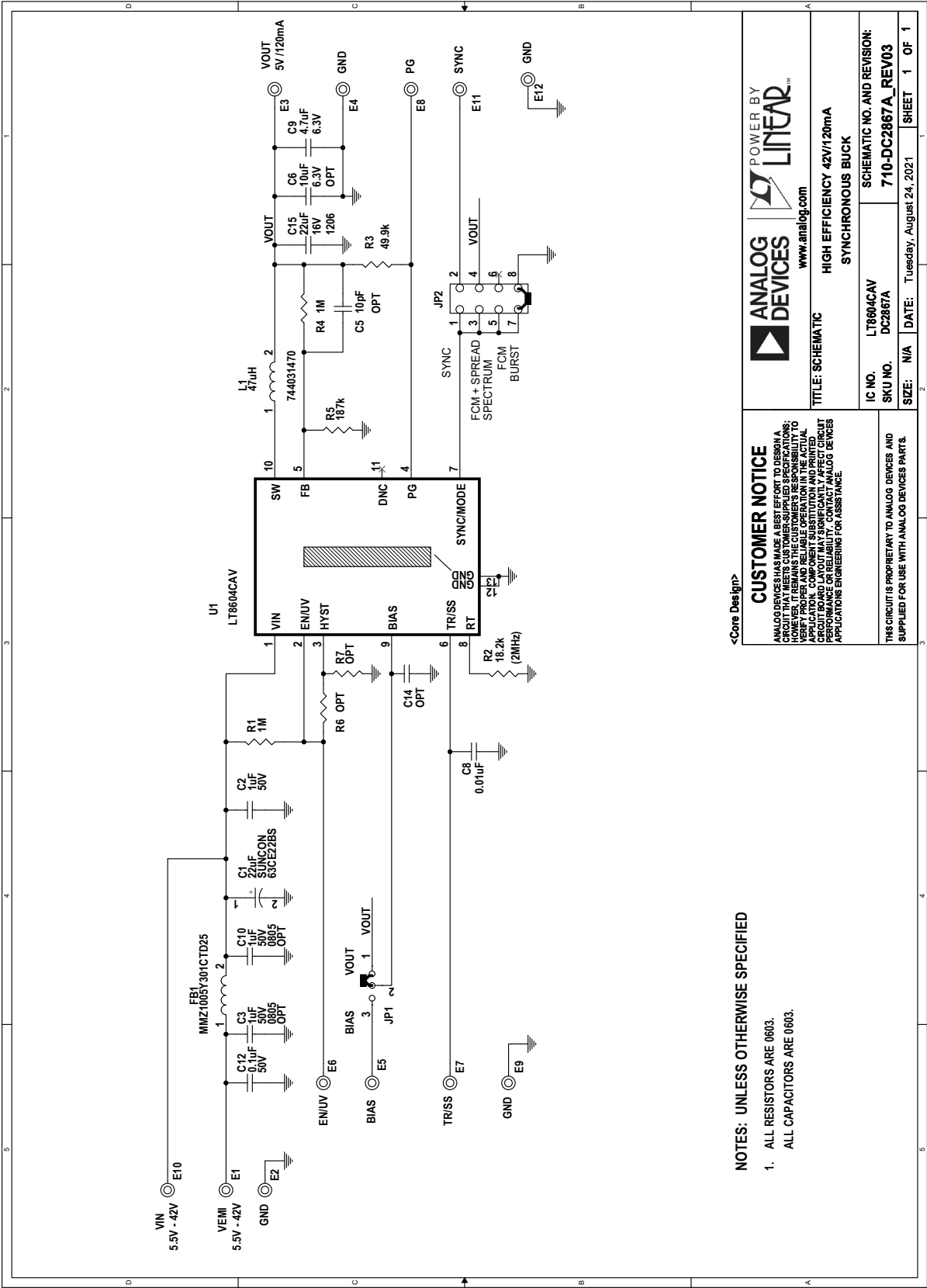
Figure 3. Efficiency in Burst Mode and Forced Continuous Mode. $R_T = 18.2k$

DEMO MANUAL DC2867A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, 22 μ F, ALUM. ELECT, 63V, 20%, 6.3x7.7mm, CE-BS	SUN ELECTRONIC INDUSTRIES CORP, 63CE22BS
2	1	C2	CAP, 1 μ F, X7R, 50V, 10%, 0603	AVX, 06035C105KAT2A
3	1	C8	CAP, 0.01 μ F, X7R, 16V, 10%, 0603	AVX, 0603YC103KAT2A
4	1	C9	CAP, 4.7 μ F, X5R, 6.3V, 10%, 0603	KEMET, C0603C475K9PACTU
5	1	C12	CAP, 0.1 μ F, X7R, 50V, 10%, 0603	AVX, 06035C104KAT2A
6	1	C15	CAP, 22 μ F, X5R, 16V, 10%, 1206	AVX, 1206YD226KAT2A
7	1	FB1	IND., 300 Ω , FERRITE BEAD, 25%, 250mA, 0402, AEC-Q200	MMZ1005Y301CTD25
8	1	L1	IND., 47 μ H, PWR, SHIELDED, 30%, 0.39A, 940m Ω , 3816	WURTH ELEKTRONIK, 744031470
9	2	R1, R4	RES., 1M, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031M00FKEA
10	1	R2	RES., 18.2k, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF1822
11	1	R3	RES., 49.9k, 1%, 1/10W, 0603	NIC, NRC06F4992TRF
12	1	R5	RES., 187k, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF1873V
13	1	U1	IC, 42V 120mA BUCK REGULATOR, LQFN-12	ANALOG DEVICES, LT8604CAV#TRMPBF
Additional Demo Board Circuit Components				
1	0	C5	CAP, 10pF, C0G, 16V, 5%, 0603, OPT	
2	0	C6	CAP, 10 μ F, X5R, 6.3V, 20%, 0603, OPT	
3	0	C3, C10	CAP, 1 μ F, X7R, 50V, 10%, 0805	
4	0	C14	CAP, OPTION, 0603	
5	0	R6, R7	RES., OPTION, 0603	
Hardware: For Demo Board Only				
1	10	E1-E10	TEST POINT, TURRET, 0.094" MTG. HOLE, PCB 0.062" THK	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	CONN., HDR, MALE, 1x3, 2mm, VERT, ST, THT, NO SUBS. ALLOWED	WURTH ELEKTRONIK, 62000311121
3	1	JP2	CONN., HDR, MALE, 2x4, 2mm, VERT, ST, THT	WURTH ELEKTRONIK, 62000821121
4	1	XJP1, XJP2	CONN., SHUNT, FEMALE, 2 POS, 2mm	WURTH ELEKTRONIK, 60800213421
5	4	MP1-MP4	STANDOFF, NYLON, SNAP-ON, 0.50"	WURTH ELEKTRONIK, 702935000

SCHEMATIC DIAGRAM



DEMO MANUAL DC2867A



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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