LT8604
High Efficiency 42V, 120mA Synchronous Buck Regulator

DESCRIPTION

Demonstration circuit EVAL-LT8604-AZ features the LT®8604, a high efficiency 42V, 120mA synchronous step-down regulator in 10-Lead 3mm × 2mm side-wettable DFN package. The demo board is designed for 120mA at 5V output from a 5.9V to 42V input, with switching frequency of 0.7MHz. The wide input range allows a variety of input sources, such as automotive batteries and industrial supplies.

The LT8604 is a compact high efficiency, and high frequency synchronous monolithic step-down switching regulator. The regulator is featured with ultralow 2.5µA quiescent current with the output in full regulation, making it an ideal solution for applications requiring highest efficiency at very light load currents, such as automotive and battery powered portable instruments.

Peak current mode control with minimum on-time of as small as 35ns allows high step-down conversion even at high frequency. The LT8604 switching frequency can be programmed via an oscillator resistor over a 200kHz to 2.2MHz range. The default frequency of the evaluation board is 700kHz.

The demo board has an EMI filter installed. The EMI performance of the board 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 peak limit test from 30MHz to 1GHz, with a wide margin.

The LT8604 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. The layout recommendations for best thermal performance are available in the data sheet Application Information section. Contact ADI applications engineer for technical support.

Design files for this circuit board are available.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN_EMI}	Input Supply Range with EMI Filter		5.9		42	V
V_{OUT}	Output Voltage		4.85	5	5.15	V
I_{OUT}	Maximum Output Current		120			mA
f_{SW}	Switching Frequency			700		kHz
EFF	Typical efficiency	V_{IN} = 12V, I_{OUT} = 60mA		93		%

QUICK START PROCEDURE

Demonstration circuit EVAL-LT8604-AZ is easy to set up to evaluate the performance of the LT8604. 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 and GND, and load from VOUT to GND.
2. Turn on the power at the input. Make sure that the input voltage does not exceed 42V.
3. 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 is shorted.
4. 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.

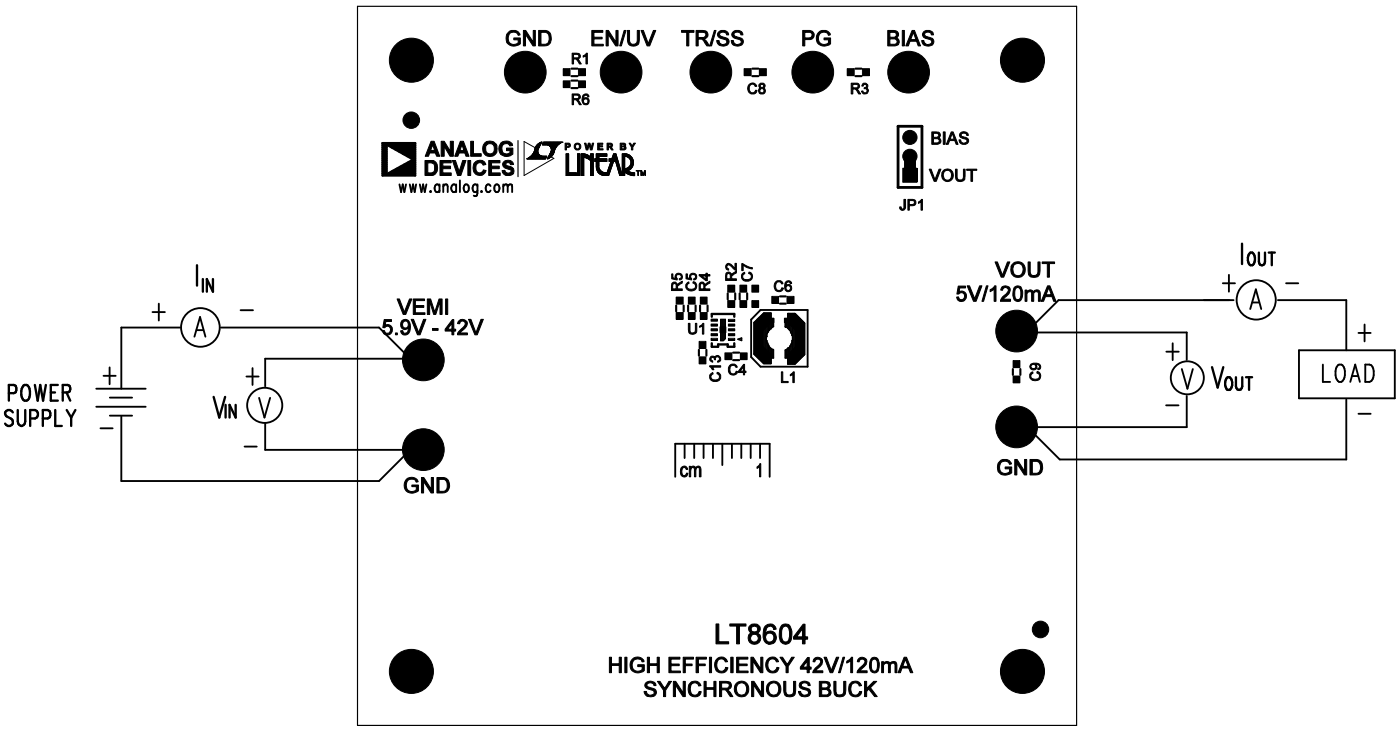


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

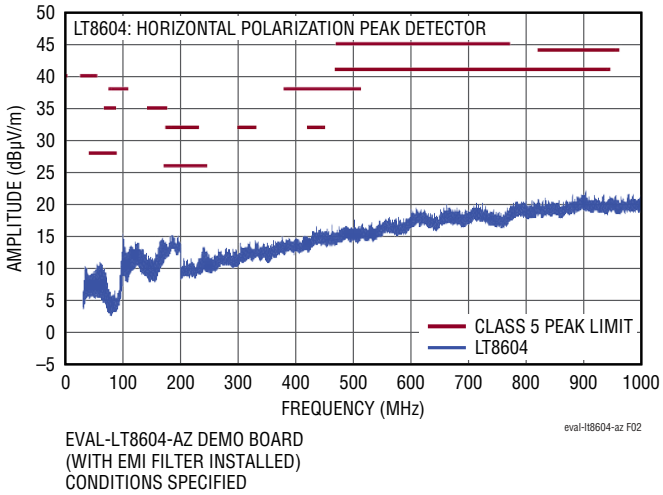


Figure 2. Radiated EMI Performance, CISPR 25, Peak Limit. V_{IN} = 14V. f_{SW} = 0.7MHz

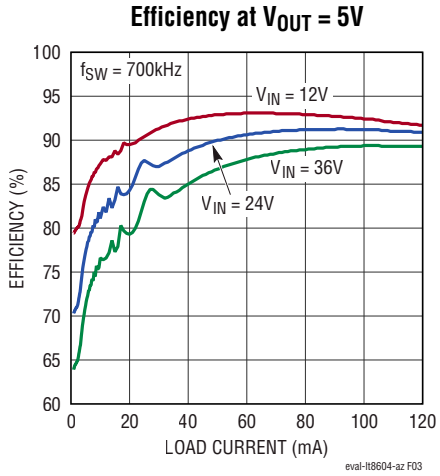
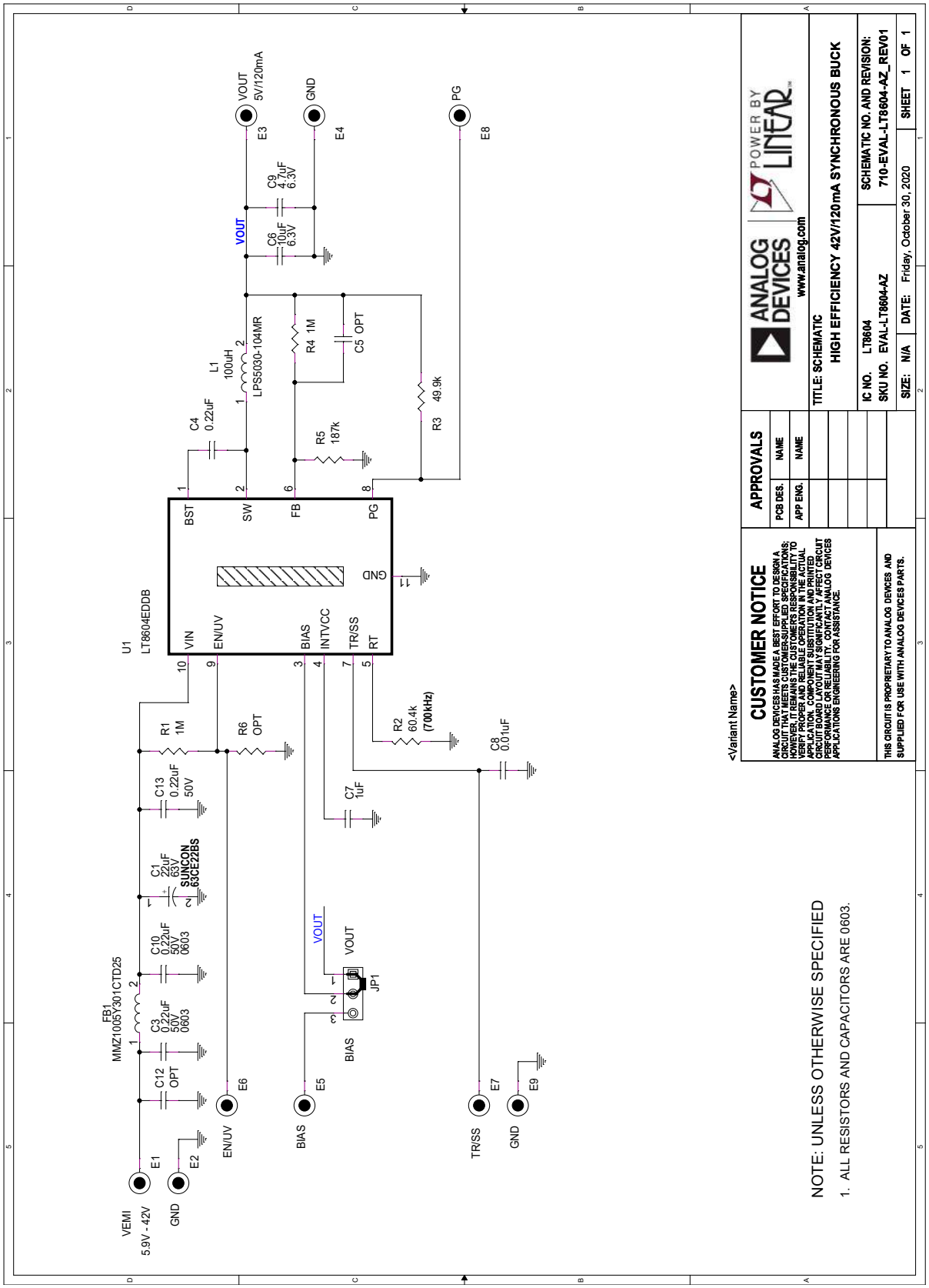


Figure 3. Efficiency. V_{IN} = 12V, 24V, 36V. f_{SW} = 0.7MHz

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., 22µF, ALUM. ELECT., 63V, 20%, 6.3mm × 7.7mm, CE-BS	SUN ELECTRONIC INDUSTRIES CORP, 63CE22BS
2	3	C13, C3, C10	CAP., 0.22µF, X7R, 50V, 10%, 0603, AEC-Q200	MURATA, GCM188R71H224KA64D
3	1	C4	CAP., 0.22µF, X7R, 16V, 10%, 0603	AVX, 0603YC224KAT2A
4	1	C6	CAP., 10µF, X5R, 6.3V, 20%, 0603	MURATA, GRM188R60J106ME47D
5	1	C7	CAP., 1µF, X7R, 16V, 10%, 0603	KEMET, C0603C105K4RAC7867
6	1	C8	CAP., 0.01µF, X7R, 16V, 10%, 0603	AVX, 0603YC103KAT2A
7	1	C9	CAP., 4.7µF, X5R, 6.3V, 10%, 0603	KEMET, C0603C475K9PACTU
8	1	FB1	IND., 300Ω, FERRITE BEAD, 25%, 250mA, 0402, AEC-Q200	MMZ1005Y301CTD25
9	1	L1	IND., 100µH, PWR, SHIELDED, 20%, 0.75A, 600mΩ, 4.9 × 4.9 × 3, AEC-Q200	COILCRAFT, LPS5030-104MRB
10	2	R1, R4	RES., 1M, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031M00FKEA
11	1	R2	RES., 60.4kΩ, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF6042V
12	1	R3	RES., 49.9kΩ, 1%, 1/10W, 0603	NIC, NRC06F4992TRF
13	1	R5	RES., 187kΩ, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ3EKF1873V
14	1	U1	IC, 42V 100mA BUCK REGULATOR, DFN-10	ANALOG DEVICES, LT8604EDDBM#PBF
Additional Demo Board Circuit Components				
1	0	C5, C12	CAP., OPTION, 0603	
2	0	R6	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, 1 × 3, 2mm, VERT, ST, THT, NO SUBS. ALLOWED	WURTH ELEKTRONIK, 62000311121
3	1	XJP1	CONN., SHUNT, FEMALE, 2 POS, 2mm	WURTH ELEKTRONIK, 60800213421
4	4	MP1-MP4	STANDOFF, NYLON, SNAP-ON, 0.50"	WURTH ELEKTRONIK, 702935000

SCHEMATIC DIAGRAM



Rev. 0

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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