

LTC3810-5 Current Mode Synchronous Switching Regulator Controller

DESCRIPTION

Demonstration circuit 1168 is a current mode synchronous switching regulator featuring the LTC3810-5. The circuit is configured as a synchronous step-down regulator operating at 250kHz switching frequency. Output voltage is 12V at 10A maximum load. The input voltage range is 14V – 60V.

The operating mode can be selected with jumper JP1. Depending on the position of this jumper, at low load the circuit will operate in forced continuous mode (for best load transient response at low current) or in pulse skip mode (for best efficiency at low current).

A Power Good output is provided. The PGOOD output is normally high, with a pull up resistor to VLOGIC. If the output voltage is not within $\pm 10\%$ of nominal value the PGOOD signal will go low.

The switching frequency can be synchronized to an external clock signal.

Design files for this circuit board are available. Call the LTC factory.

L, LTC, LTM, LT, Burst Mode, OPTI-LOOP, Over-The-Top and PolyPhase are registered trademarks of Linear Technology Corporation. Adaptive Power, C-Load, DirectSense, Easy Drive, FilterCAD, Hot Swap, LinearView, μ Module, Micropower SwitcherCAD, Multimode Dimming, No Latency $\Delta\Sigma$, No Latency Delta-Sigma, No R_{SENSE} , Operational Filter, PanelProtect, PowerPath, PowerSOT, SmartStart, SoftSpan, Stage Shedding, SwitcherCAD, ThinSOT, UltraFast and VLDO are trademarks of Linear Technology Corporation. Other product names may be trademarks of the companies that manufacture the products.

PERFORMANCE SUMMARY Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		14		60	V
V_{OUT}	Output Voltage	$V_{IN} = 24V, I_{LOAD} = 100mA$	11.8	12	12.2	V
I_{OUT}	Output Current	$V_{IN} = 24V$	0		10	A
I_Q	Input Current In Shutdown	$V_{IN} = 24V, RUN/SS = 0V$		262	622	μA
I_{IN}	V_{IN} Current In Pulse Skip Mode (No Load)	$V_{IN} = 24V, V_{FCB} = INTVCC, \text{No Load}$		3		mA
I_{IN}	V_{IN} Current In Forced Continuous Mode (No Load)	$V_{IN} = 24V, V_{FCB} = 0V, \text{No Load}$		32		mA
Efficiency	Efficiency	$V_{IN} = 24V, I_{OUT} = 6A$		95.1		%

OPERATING PRINCIPLES

The LTC3810-5 is a synchronous step-down switching regulator controller that can directly step down voltages from up to 60V input, making it ideal for telecom and automotive applications.

The LTC3810-5 uses a constant on-time valley current control architecture to deliver very low duty cycles with accurate cycle-by-cycle current limit without requiring a current sense resistor. The cur-

rent limit is adjustable and the operating frequency is selected by an external resistor.

The LTC3810-5 has a precise (0.5%) internal reference, a 25MHz error amplifier, large gate drivers, programmable softstart, a shutdown pin, a Power Good output, a Sync input and a flexible bias regulator circuit that can be configured in many different ways to fit the application.

LTC3810-5

The 5.5V bias regulator circuit controls an external series transistor which helps to reduce internal power dissipation when the bias voltage is generated from the input voltage. LTC3810-5 also contains an internal low dropout regulator that can be used when an external voltage source in the range 4.7V...15V is available. Demonstration Circuit 1168 uses this internal regulator to generate the bias voltage from the 12V output during normal operation, while the external series transistor is used for startup.

Demonstration Circuit 1168 is configured to use current sense resistor, but can easily be modified to sense current without sense resistor by moving zero ohm resistor R20 to R21, adjusting the current limit for the increased sense voltage by moving R5 to R4, and replacing the current sense resistor (R22, R23) with a short circuit.

EQUIPMENT

4 DMMs

1 DC Supply 0-60V capable of delivering at least 150W

1 Adjustable load 0-10A

QUICK START PROCEDURE

Demonstration circuit 1168 is easy to set up to evaluate the performance of the LTC3810-5. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions:

JP1 Forced continuous mode operation

JP2 ON

2. With power off, connect the input power supply to Vin and GND.

3. Set the power supply to 24V and turn on the power at the input.

NOTE. Make sure that the input voltage does not exceed 60V.

4. Check for the proper output voltage. Vout = 11.8V to 12.2V.

NOTE. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

5. Once the proper output voltages are established, adjust input voltage and load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

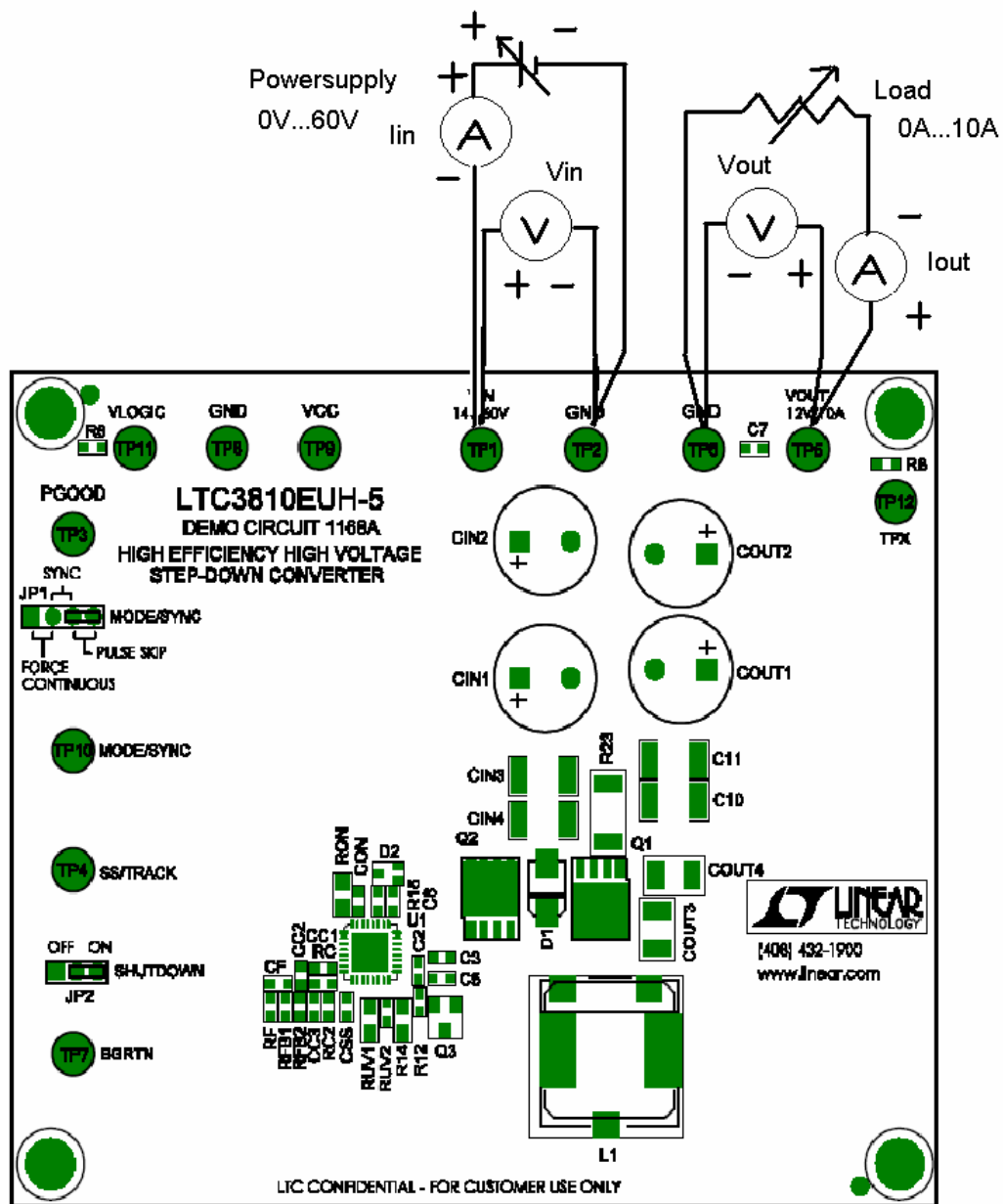
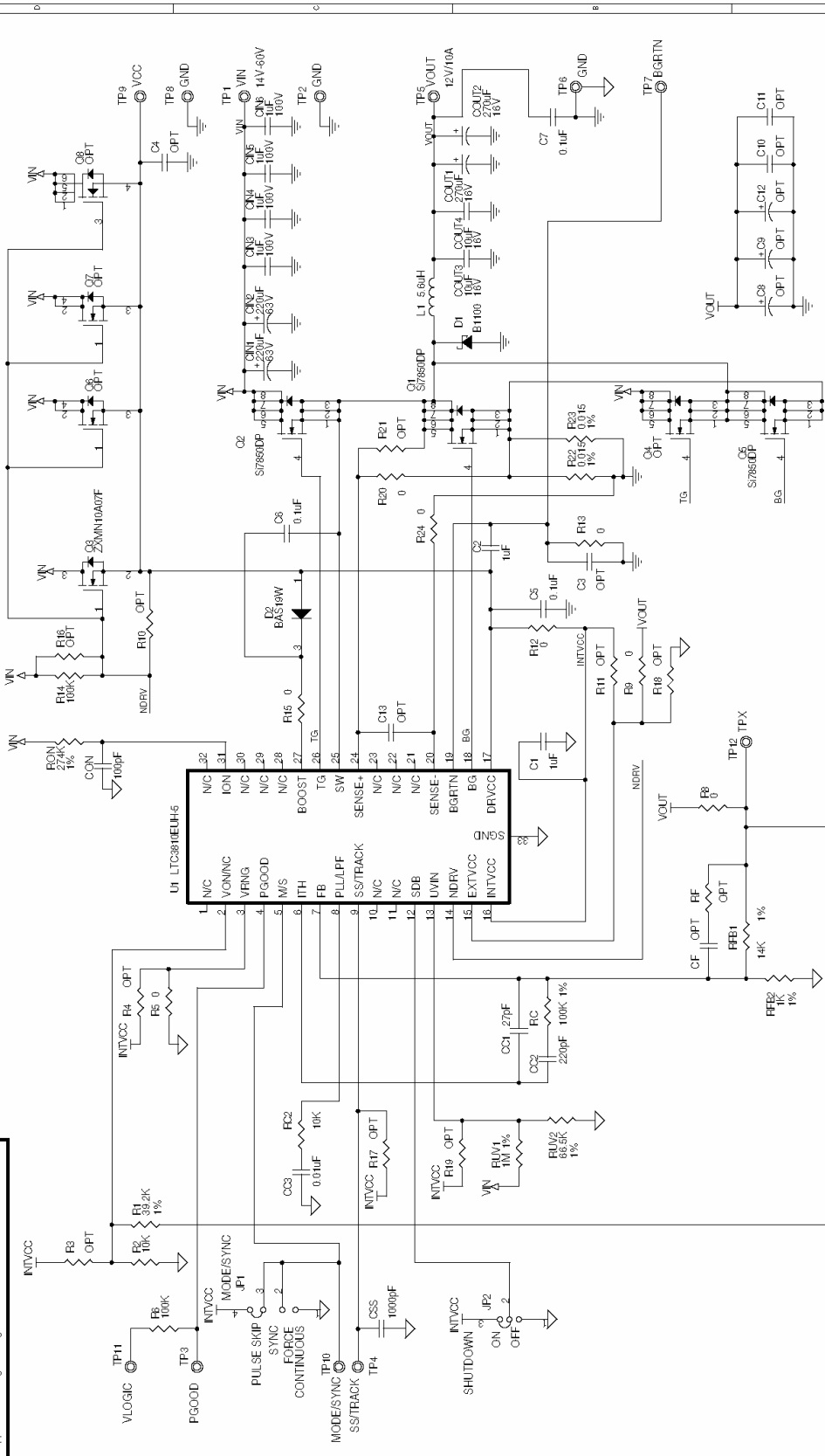


Figure 1. Proper Measurement Equipment Setup

This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.

Customer Notice: Linear Technology has made a best effort to design a circuit to meet the customer's specifications, but does not warrant the circuit for any specific application. Component substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS 2 PAGES INTERPRET DIM AND TOL PER ASME Y14.5M-1994		CONTRACT NO.		DATE	
APPROVALS		DRAWN		1997108	
CHECKED		APPROVED			
ENGINEER		DESIGNER			
THIRD ANGLE PROJECTION		DO NOT SCALE DRAWING		Tuesday, November 13, 2007	
TITLE		SCALE		SHEET	
SCH. LTC3810EUH-5, HIGH EFFICIENCY HIGH VOLTAGE STEP-DOWN CONVERTER		DWG NO.		1	
SIZE		CAGE CODE		OF	
Custom		DCT168A		1	
FILE NAME		1168A-2.DSN		2	

LINEAR TECHNOLOGY		1600 McCarthy Blvd Folsom, CA 95630 Phone: (916) 452-1900 Fax: (916) 452-1907	
TITLE		DWG NO.	
SCH. LTC3810EUH-5, HIGH EFFICIENCY HIGH VOLTAGE STEP-DOWN CONVERTER		DCT168A	
SIZE		CAGE CODE	
Custom		DCT168A	
FILE NAME		1168A-2.DSN	
SCALE		SHEET	
1		OF	
2		1	