

## 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.**

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### 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	$\mu A$
$I_{IN}$	$V_{IN}$ 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

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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.

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## 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.  $V_{out} = 11.8V$  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.

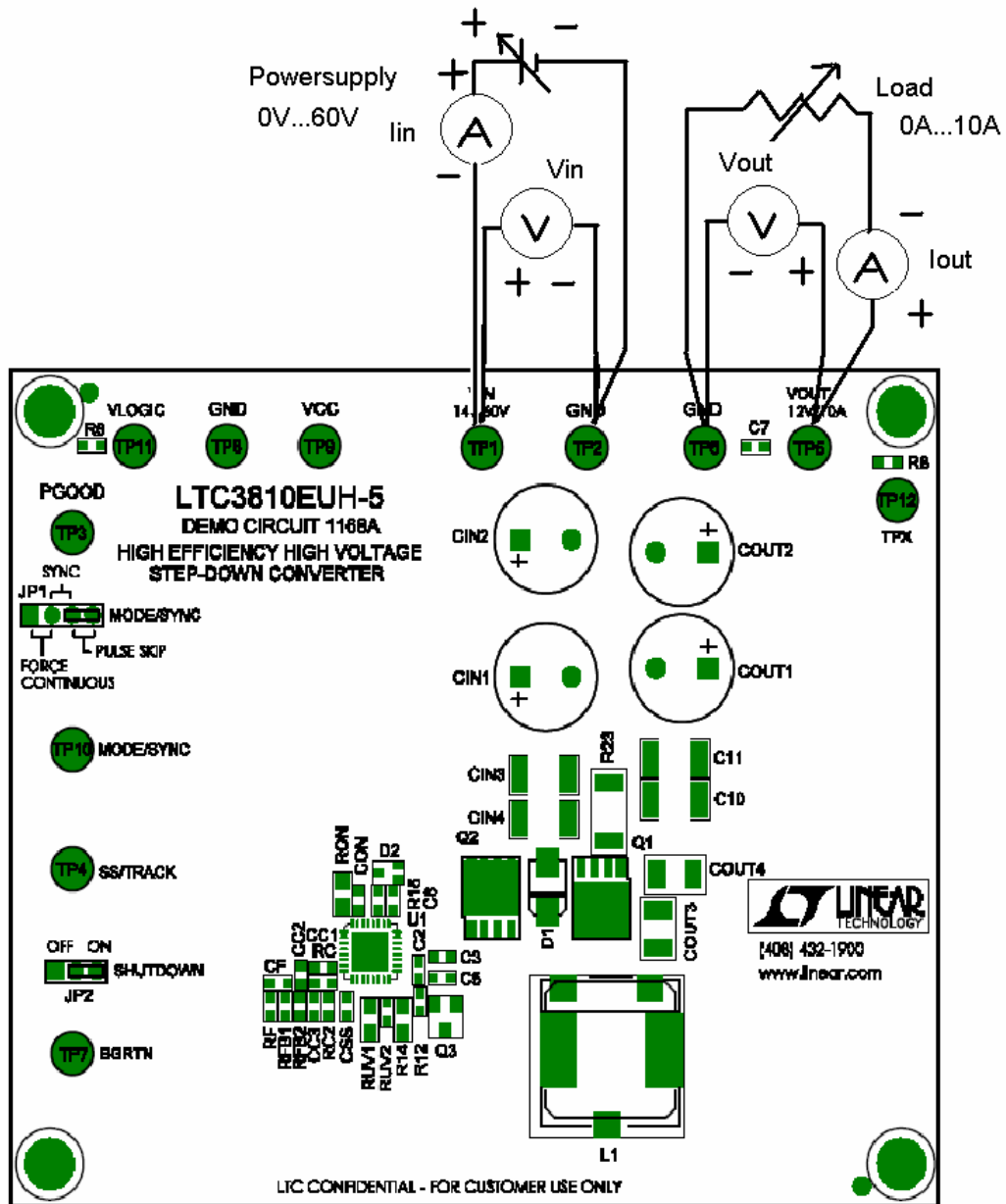
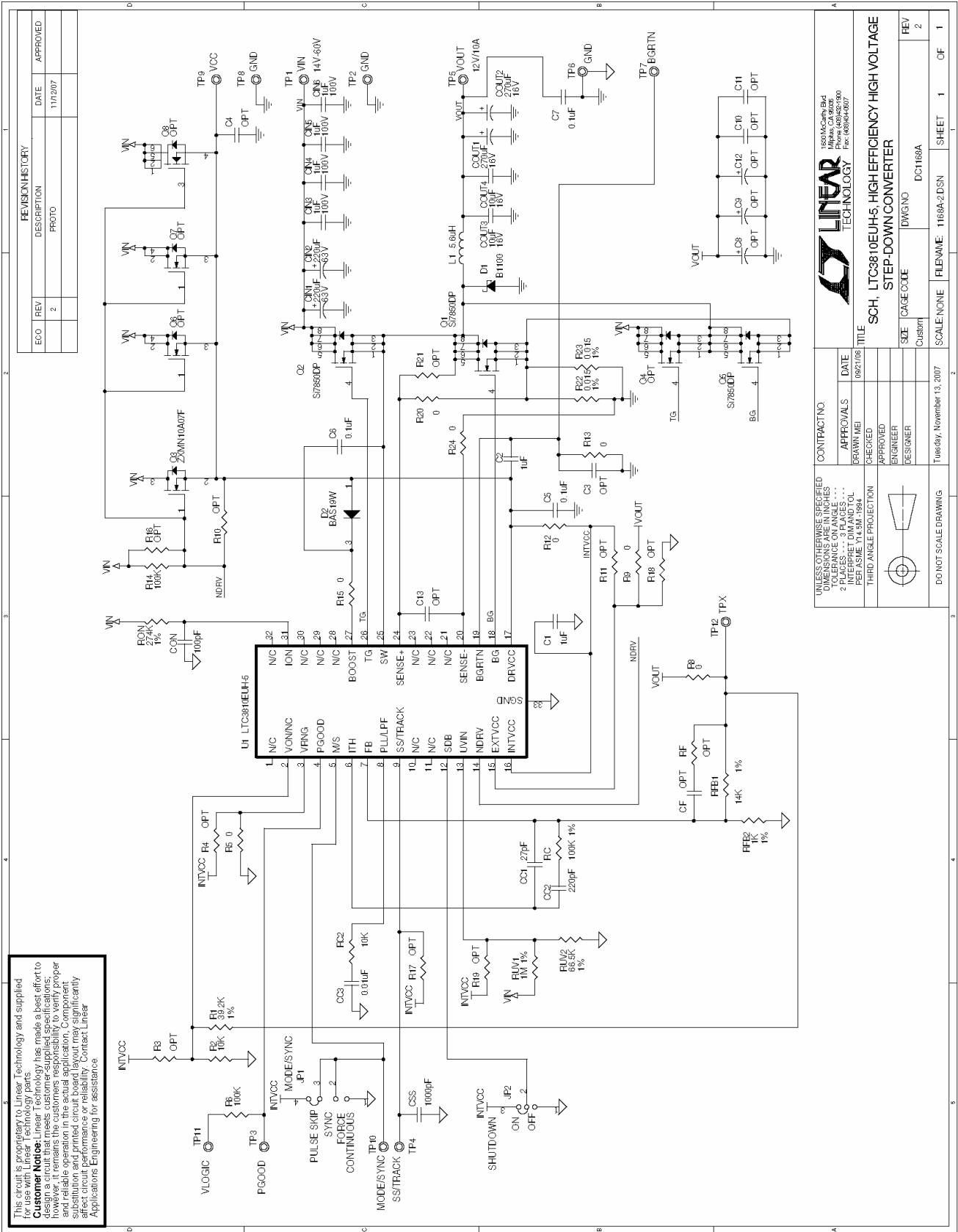


Figure 1. Proper Measurement Equipment Setup



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 that will operate reliably under a wide range of conditions. However, the customer is responsible for identifying proper and reliable operation in the actual application. Component substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.