

DESCRIPTION

Demonstration circuit 1225 is high efficiency non-isolated SEPIC (Single Ended Primary Inductor Converter) converter featuring the LTC1871-1 switching controller. The DC1225 converts 5V to 20V input to 12V output and provides over 3A of output current. The converter operates at 300kHz with efficiency over 94%. With proper amount of airflow, the DC1225 converter can generate over 3A of output current. The DC1225 can be easily modified to generate output voltages in the range from 1.23V to 48V.

Also, the DC1225 can be modified for other input voltages like 5V-36V, 9V-36V, 36V-72V, and so on. The wider input voltage range will decrease the converter efficiency. Therefore, narrow input voltage range will be more desirable.

The LTC1871-1 can be synchronized to an external clock of up to 400kHz. Please refer to LTC1871-1 data sheet for design details and applications information.

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

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Table 1. Performance Summary

PARAMETER	CONDITION	VALUE
Minimum Input Voltage	$I_{OUT} = 0A$ to 3A	5V
Maximum Input Voltage	$I_{OUT} = 0A$ to 3A	20V
V_{OUT}	$V_{IN} = 5V$ to 20V, $I_{OUT} = 0A$ to 3A	12V $\pm 3\%$
Typical Output Ripple V_{OUT}	$V_{IN} = 5V$ to 20V, $I_{OUT} = 0A$ to 3A	100mV _{p-p}
Nominal Switching Frequency		300kHz

QUICK START PROCEDURE

Demonstration circuit 1225 is easy to set up to evaluate the performance of LTC1871-1 circuit. **Refer to Figure 1 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 2. for proper scope probe technique.

1. With power off, connect the input power supply to V_{in} and GND. Make sure that the input power supply has sufficient current rating at minimum input voltage for the required output load.

2. Turn on the power at the input.

NOTE: Make sure that the input voltage does not exceed 20V.

3. Check for the proper output voltage.
 $V_{out} = 12V, \pm 3\%$.

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

4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1225

HIGH EFFICIENCY SEPIC

- The DC1225 is equipped with an output capacitor CSYS (150uF) that approximates typical system rail capacitance. If system board already has capacitance of similar value CSYS can be removed.
- The input capacitor Cin4 is optional and is used to help with filtering when board is connected to lab supply with long leads. The capacitor Cin4 can be removed if the input power source is close and has low source impedance.

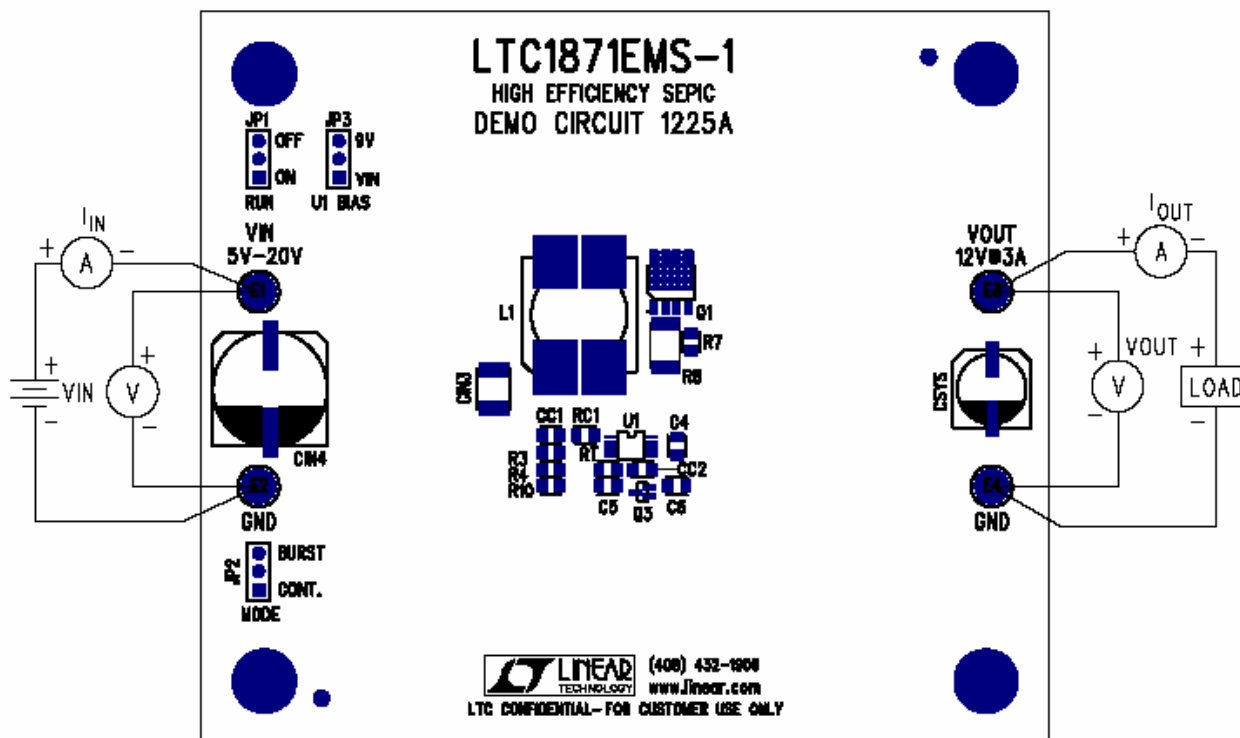


Figure 1. Proper Measurement Equipment Setup

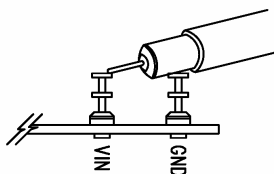


Figure 2. Scope Probe Placement for Measuring Input or Output Ripple

CHANGING THE OUTPUT VOLTAGE

To set the output voltage lower than 12V, change the bottom voltage divider resistor connected to FB pin of U1 (see the schematic on page 5). For example, to get 9V output, change R3 resistor value to 17.4k. However, keep in mind that changing the transformer as well may increase the efficiency.

To operate at higher input voltages the optional pre-regulator circuit Q2 can be used. Also, if the output voltage is in the range from 5V-36 the bias power for U1 can be diode-ORed from the output and input. Please contact LTC factory for details.

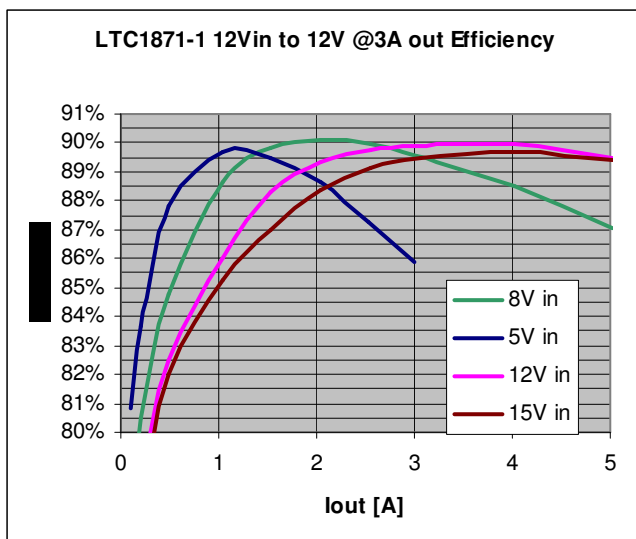


Figure 3. High efficiency of DC1225 allows the board to be used in thermally critical applications with outputs over 3A.

OUTPUT LOAD STEP RESPONSE

The load step response of DC1225 is very fast even though relatively small amount of output capacitance is present (120uF ceramic and 150uF electrolytic). The load step transients are shown in Figure 4.

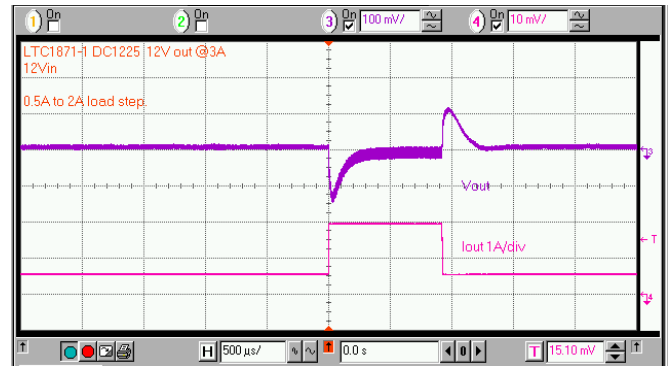


Figure 4. Fast transient response of DC1225 is achieved with a small amount of output capacitance.

SOFT START FUNCTION

The DC1225 features Q3 soft-start circuit that controls the inrush current and output voltage ramp at startup. The capacitor C5 controls the startup period. The startup waveforms are shown in figure 5.

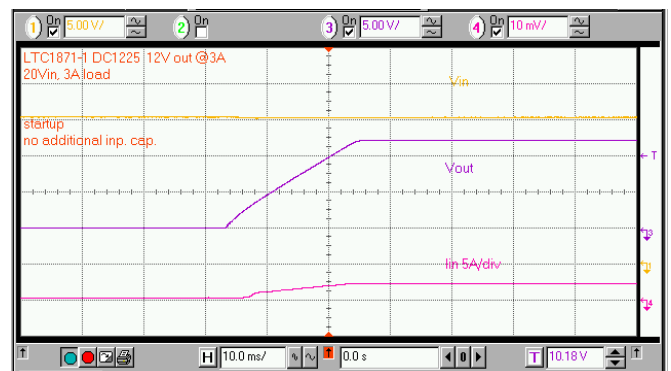
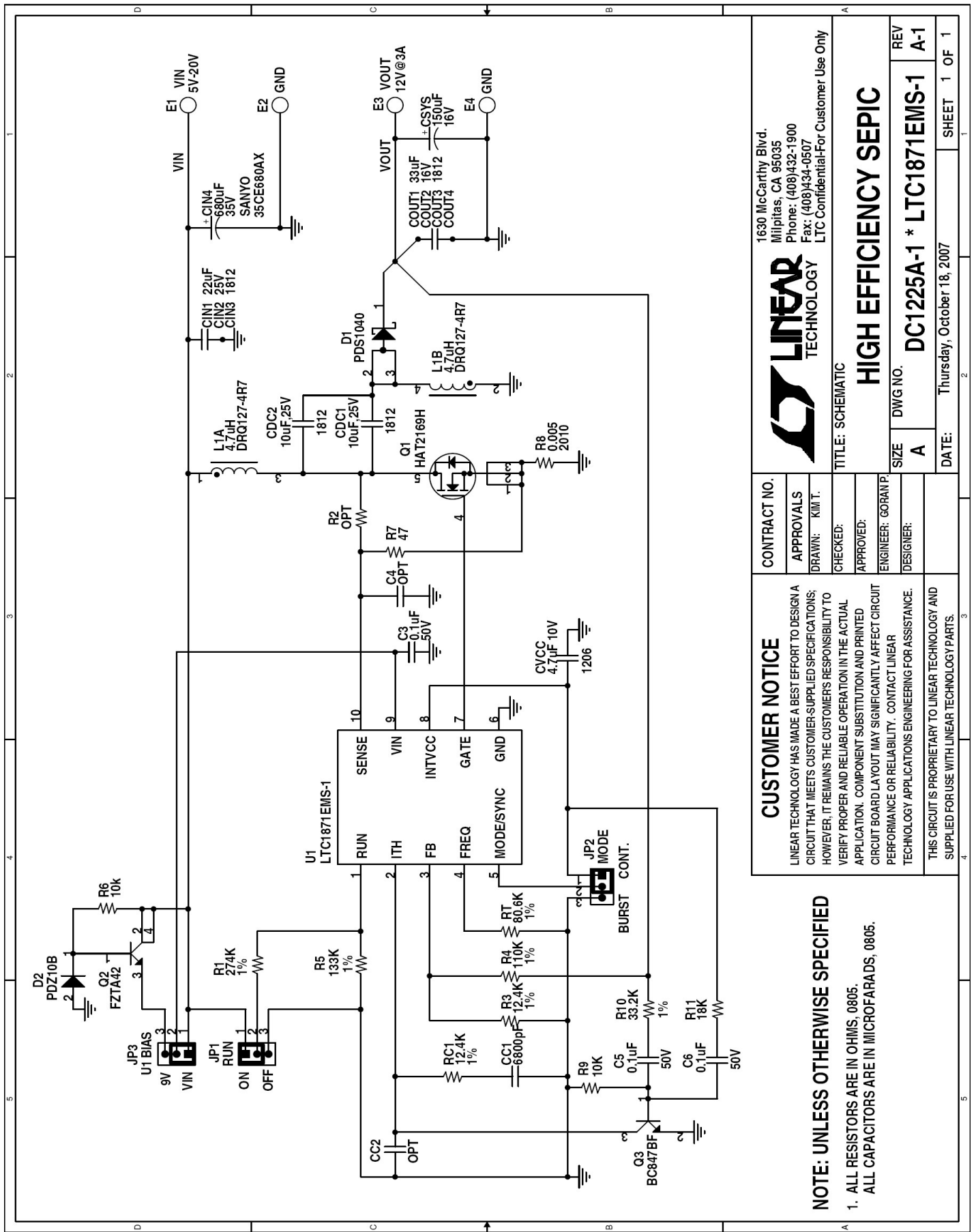


Figure 5. The DC1225 ramps the output slowly at startup without generating an input current surge.

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1225 HIGH EFFICIENCY SEPIC



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TITLE: SCHEMATIC	REV A-1
SIZE A	DWG NO. DC1225A-1 * LTC1871EMS-1
DATE: Thursday, October 18, 2007	SHEET 1 OF 1

NOTE: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTORS ARE IN OHMS, 0805.
 ALL CAPACITORS ARE IN MICROFARADS, 0805.

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