

DESCRIPTION

Demonstration circuit DC1409 is DC/DC boost converter featuring the LTC3788 constant frequency current mode boost controller. The DC1409A operates over 5V to 24V input and provides 8A to 10A of output current at 12V output. Also, the DC1409A provides a second 24V output capable of delivering 3A to 5A. The 300kHz constant frequency operation results in small and efficient circuit. The converter provides high output voltage accuracy (typically $\pm 3\%$) over wide load range with no minimum load requirement.

The demonstration circuit can be easily modified to generate different output voltages. Also, the two

outputs can be connected together to generate single output with two phase operation. Please consult LTC factory for details.

The DC1409 has small circuit footprint. It is a high performance and cost effective solution for Telecom, Automotive and Power Over Ethernet applications.

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 DC1409A-A	$I_{OUT1} = 0A$ to $3A$, $I_{OUT2} = 0A$ to $8A$	5V
Maximum Input Voltage	$I_{OUT1} = 0A$ to $5A$ $I_{OUT2} = 0A$ to $10A$	24V
V_{OUT1}	$V_{IN} = 5V$ to $24V$, $I_{OUT1} = 3A$	$24V \pm 3\%$
V_{OUT2}	$V_{IN} = 5V$ to $12V$, $I_{OUT2} = 8A$	$12V \pm 3\%$ (see text)
Typical Output Ripple V_{OUT1}	$V_{IN} = 6V$, $I_{OUT} = 3A$	$200mV_{P-P}$
V_{OUT2}	$V_{IN} = 12V$, $I_{OUT} = 8A$	$200mV_{P-P}$
Nominal Switching Frequency		350kHz

QUICK START PROCEDURE

Demonstration circuit DC1409 is easy to set up to evaluate the performance of the LTC3788. For proper measurement equipment setup refer to Figure 1 and follow the procedure below:

NOTE: When measuring the input or output voltage ripple, care must be taken to minimize the length of oscilloscope probe ground lead. Measure the input or output voltage ripple by connecting the

probe tip directly across the VIN or VOUT and GND terminals as shown in Figure 2.

1. With power off, connect the input power supply to Vin and GND.
2. Check the Vcc Bias voltage-setting jumper JP5. Move it into Vin position if required.
3. Turn the input power source on and slowly increase the input voltage. Be careful not to exceed 24V.

NOTE: Make sure that the input voltage Vin does not exceed 24V. If higher operating voltage is required, power components with higher voltage ratings should be used.

4. Set the input voltage to 6V and check for the proper output voltage of 12V and 24V.

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 voltage is established, adjust the load and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

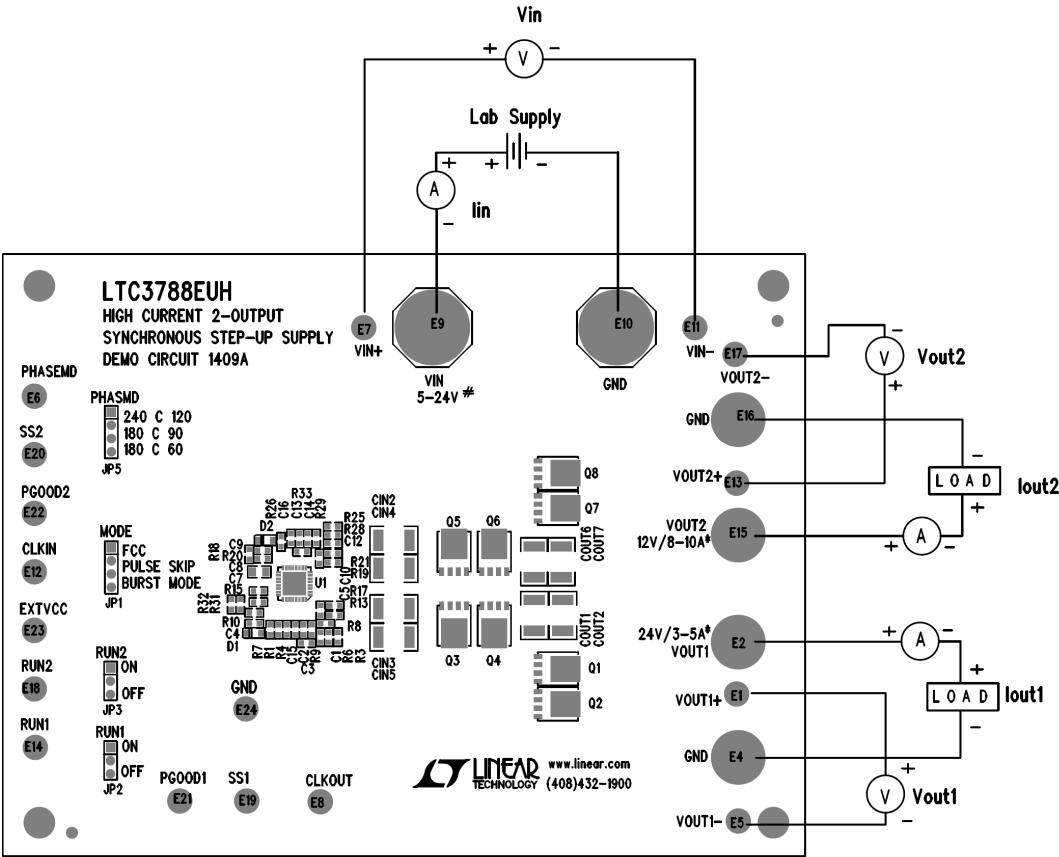


Figure 1. Proper Measurement Equipment Setup

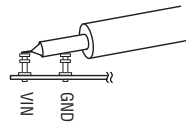


Figure 2. Measuring Input or Output Ripple

CHANGING THE OUTPUT VOLTAGE

To set the output voltage lower than 12V or 24V, change the bottom voltage divider resistors connected to LTC3788 FB pin (see the schematic on page 6).

To get higher than 12V and 24V output voltages MOSFETs and capacitors with higher voltage ratings may be required. Please contact LTC factory for details.

Note that the output voltage will start following the input voltage when input voltage is greater than the voltage set by the voltage divider. In this mode (wire mode) the output rectifier MOSFET is turned continuously ON. The only losses in this mode are due to the current sense resistors, inductor and output MOSFET DC resistance.

CONVERTER EFFICIENCY AND OUTPUT CURRENT

The DC1409 output current capability depends on the input voltage and proper cooling. Typical performance of DC1409A is shown in Figure 3. As can be seen from Figure 3, the output current capability depends on the input voltage. Also, when input voltage is equal or higher than the output voltage setting (wire mode) the efficiency is very high (99%) since the converter is not really running and the output MOSFET is shorting V_{in} to V_{out} (blue trace in Figure 3).

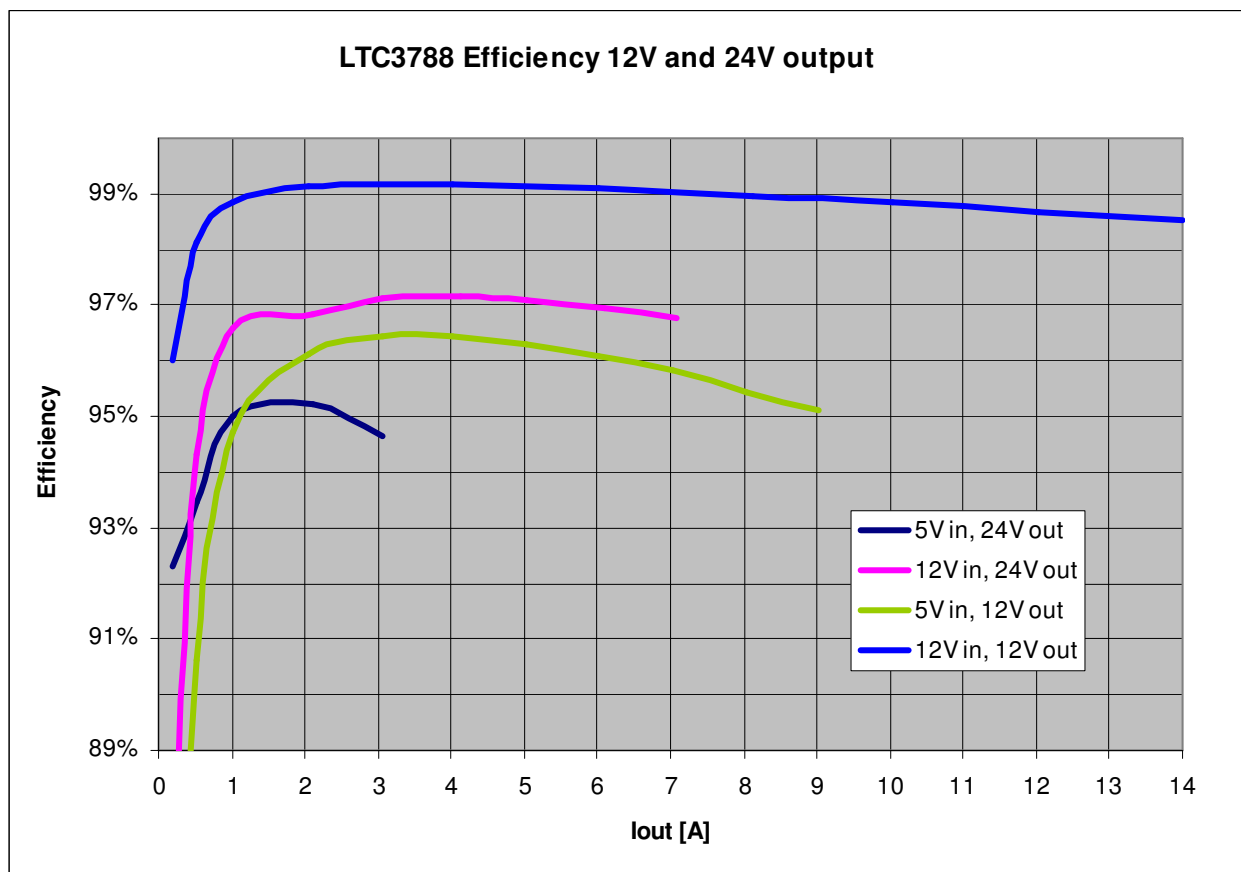


Figure 3. DC1409A Efficiency

OUTPUT LOAD STEP RESPONSE

The load step response of DC1409A is very good even though relatively small amount of output capacitance is present at the output. If higher load steps need to be handled more output capacitance can be added in order to keep the voltage transients at the desired level. The load step transients are shown in Figure 5 and Figure 6. Also, note that load step response even from 0% load is excellent thanks to synchronous rectification.

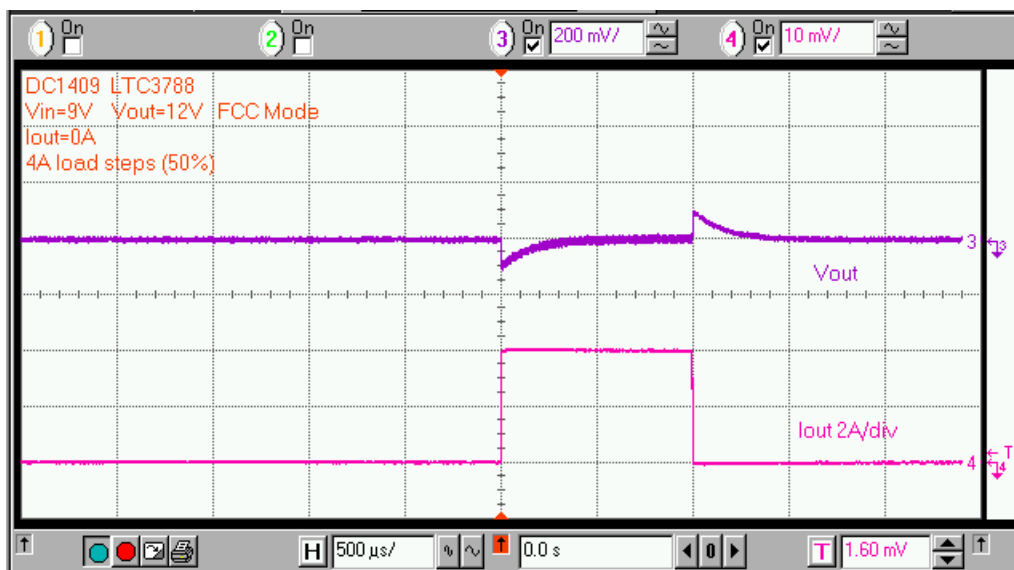


Figure 5. 12V Output load step response

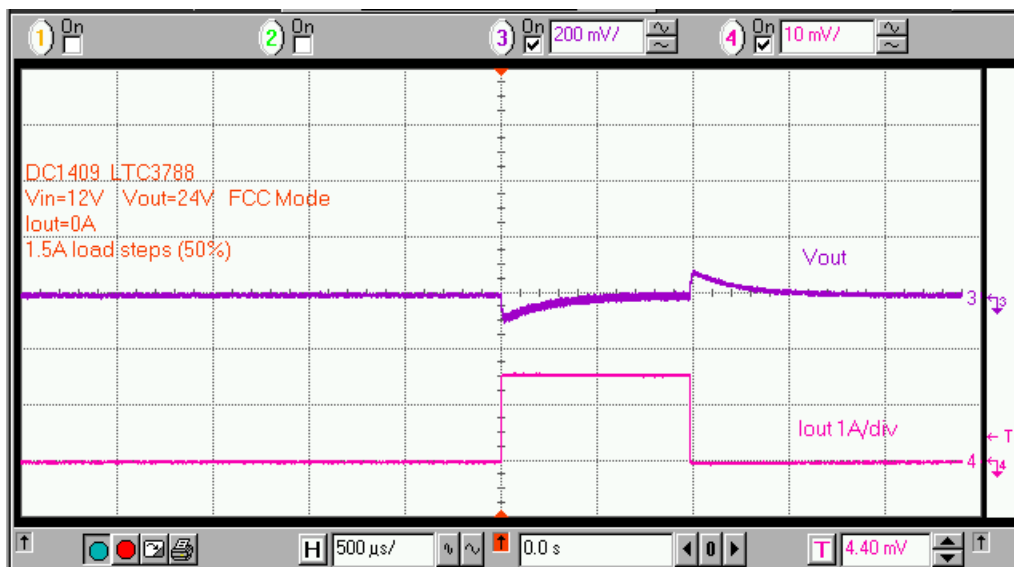


Figure 6. 24V Output load step response

