DESCRIPTION

Demonstration circuit 828 is a step-down converter, using the LTC3409 monolithic synchronous buck regulator. The DC828 has an input voltage range of 1.6V to 5.5V, and is capable of delivering up to 600mA of output current at a minimum input voltage of 1.8V. The output voltage of the DC828 can be set as low as 0.6V, the reference voltage of the LTC3409. The DC828 can operate in noise sensitive applications, due to the LTC3409 operating in pulse-skipping mode at low load currents. The DC828 is a high efficiency circuit - over 90%, and during shutdown, the DC828 consumes less than 1uA typically. In Burst-Mode™ operation, it consumes only 65uA of quiescent current. Because of the frequency-select capability of the LTC3409, the DC828 can operate pability of the LTC3409, the DC828 can operate at fixed frequencies of 2.25 MHz or 1.5 MHz, allowing the exclusive use of low profile surface-mount components. The DC828 can also be clocked by an external oscillator, due to a phase-lock loop circuit in the LTC3409. These features, plus the availability of a low profile 8-Lead DFN package, make the DC828 an ideal circuit for use in battery-powered, hand-held applications.

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

TM - Burst Mode is a trademark of Linear Technology Corporation

Table 1.

Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		1.6V
Maximum Input Voltage		5.5V
Output Voltage V_{OUT}	V_{IN} = 1.6V to 5.5V, I_{OUT1} = 0A to 600 mA	1.2V ±4%
Typical Output Ripple V_{OUT}	V_{IN} = 5V, I_{OUT1} = 600 mA (20 MHz BW)	20mV_{P-P}
Output Regulation	Line	±1%
	Load	±1%
Nominal Switching Frequency		1.7 or 2.6 MHz

QUICK START PROCEDURE

The DC828 demonstration board is easy to set up to evaluate the performance of the LTC3409. For proper measurement equipment configuration, set up the circuit according to the diagram in **Figure 1**. Before proceeding to test, insert jumper JP3 shunt into the off (lower) position, connecting the RUN pin to ground (GND), which shuts down the circuit.

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 Vin or Vout and GND terminals. See Figure 2 for proper scope probe technique.

1. Connect the input power supply and the load to the board. Do not hot-plug Vin or increase Vin over the rated maximum supply voltage of 5.5V, or the part may be damaged. Refer to figure 1 for the proper measurement equipment setup.
2. Insert the shunts in the 1.7 MHz position of jumper JP1, in the Burst-Mode position of jumper JP2, and in the 1.2V position – jumper JP4.
3. Apply 3.3V at Vin. Measure Vout; it should read 0V. If desired, one can measure the shutdown supply current at this point. The supply current will be approximately 1 uA in shutdown.
4. Turn on the circuit by inserting the shunt in jumper JP3 into the ON (upper) position. The output voltage should be regulating. Measure Vout - it should measure 1.2V +/- 2%.
5. Vary the input voltage from 2.5V to 5.5V and adjust the load current from 0 to 600mA. Vout should read between 1.2V +/- 4%.
6. Measure the output ripple voltage at any output current level; it usually will measure less than 20 mVAC.
7. Observe the voltage waveform at the switch node (pin 6 of the IC or one pin of the inductor). Verify the switching frequency is between 0.9 MHz and 2.1 MHz (T = 1.111 us and 0.476 us), and that the switch node waveform is rectangular in shape.

When finished, turn off the circuit (connecting the RUN pin to ground) by inserting the shunt in jumper JP3 into the OFF (lower) position.

Warning - if the power for the demo board is carried in long leads, the input voltage at the part could “ring”. To eliminate this, insert a small tantalum capacitor (for instance, an AVX part # TAJT226M010R) on the pads between the input power and return terminals on the bottom of the demo board. The (greater) ESR of the tantalum will dampen the (possible) ringing voltage due to the use of long input leads. On a normal, typical PCB, with short traces, the capacitor is not needed.

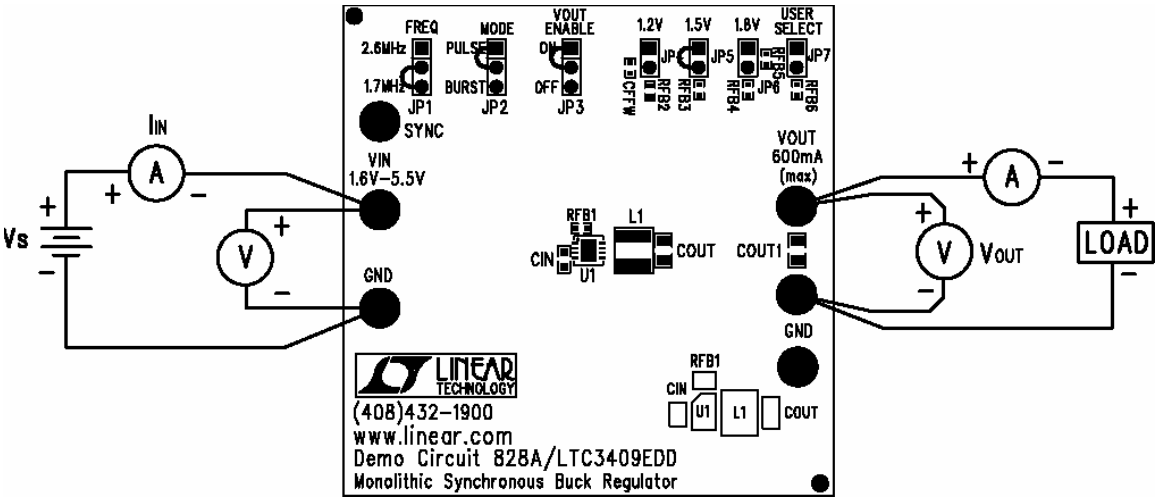


Figure 1. Proper Measurement Equipment Setup

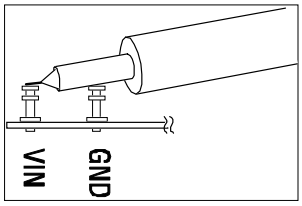


Figure 2. Measuring Input or Output Ripple

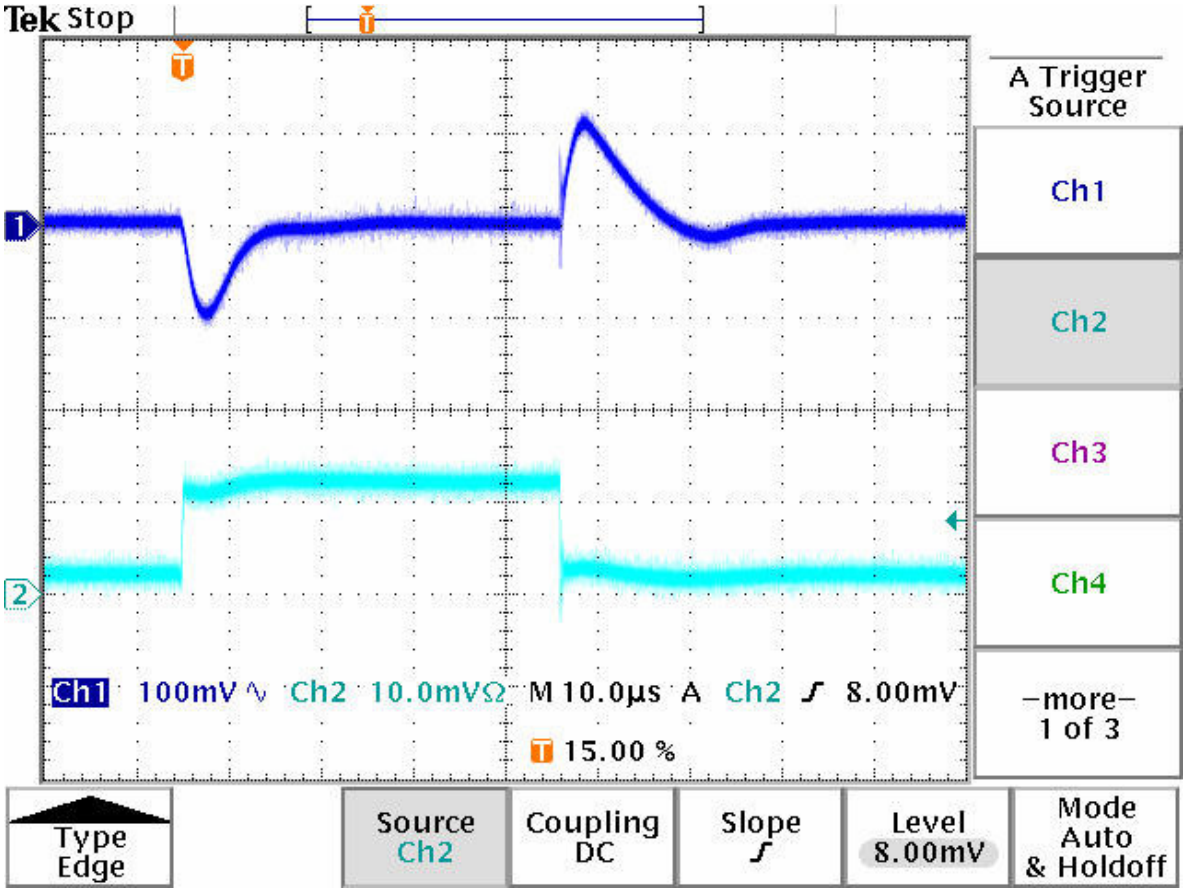


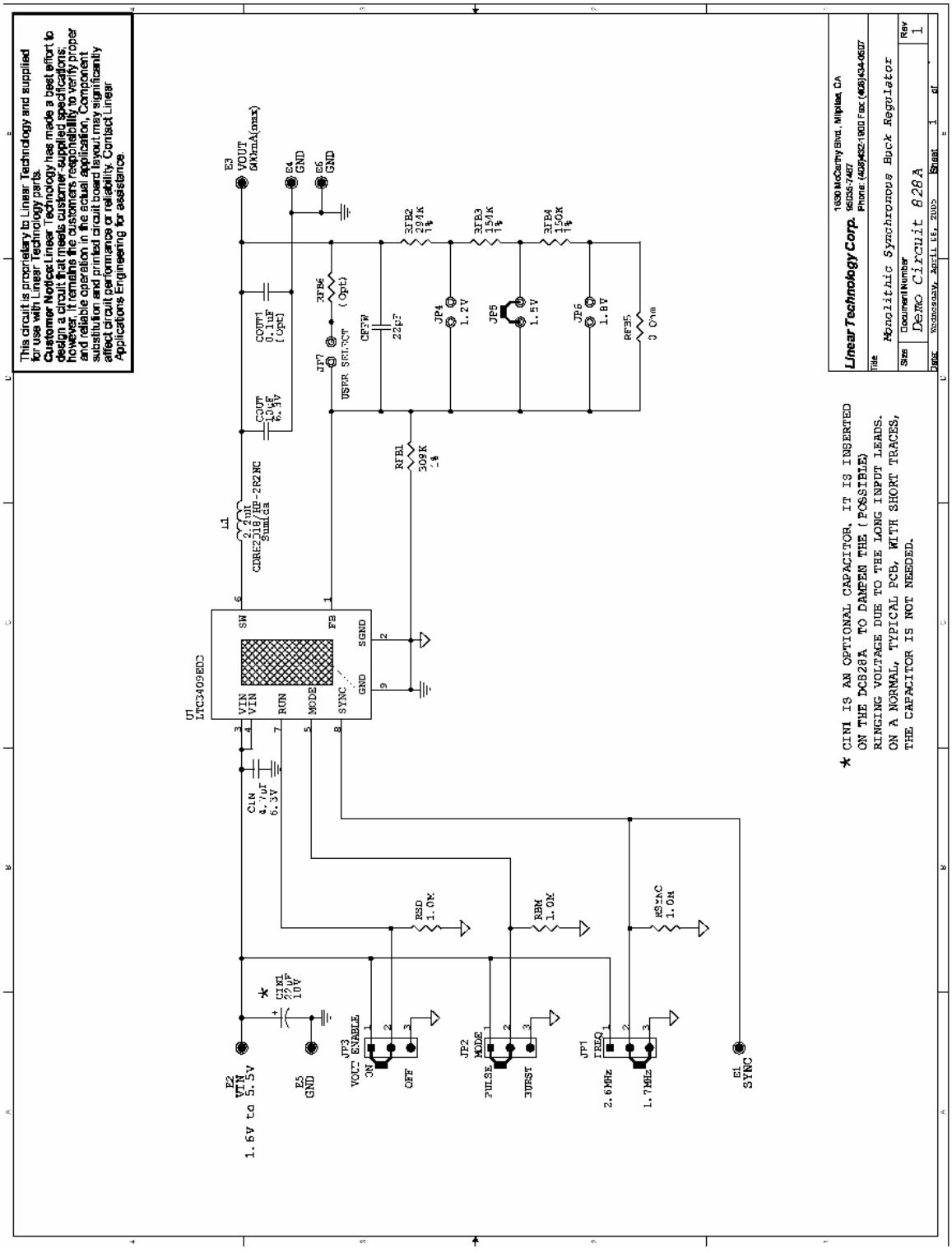
Figure 3. Load Step Response

Vin – 1.8V Vout – 1.2V

Iout Step – 500 mA

Trace 1: Output Voltage (100 mV/div AC)

Trace 2: Output Current (500 mA/div)


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 meets customer-supplied specifications; however, it remains the customers responsibility to verify 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.
Linear Technology Corp.
Monolithic Synchronous Buck Regulator
Demo Circuit 828A
U1 LTC3409EDC
L1 2.2uH CDRH2D18/HP-2R2NC Sumida
RFB1 309K
RFB2 294K 1%
RFB3 154K 1%
RFB4 150K 1%
RFB5 0 Ohm
RSD 1.0M
RBM 1.0M
RSYNC 1.0M
CIN1 22uF 10V
CIN 4.7uF 6.3V
COUT1 0.1uF (Opt)
COUT 10uF 6.3V
CFFW 22pF
RFB6 (Opt)
JP1 FREQ 2.6MHz 1.7MHz
JP2 MODE PULSE BURST
JP3 VOUT ENABLE ON OFF
JP4 1.2V
JP5 1.5V
JP6 1.8V
JP7 USER SELECT
E1 SYNC
E2 VIN 1.6V to 5.5V
E3 VOUT 600mA(max)
E4 GND
E5 GND
E6 GND
* CIN1 IS AN OPTIONAL CAPACITOR. IT IS INSERTED ON THE DC828A TO DAMPEN THE (POSSIBLE) RINGING VOLTAGE DUE TO THE LONG INPUT LEADS. ON A NORMAL, TYPICAL PCB, WITH SHORT TRACES, THE CAPACITOR IS NOT NEEDED.