QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1021A
HIGH EFFICIENCY, HIGH POWER BUCK CONVERTER WITH DIFFERENTIAL OUTPUT SENSING AND TRACKING

LTC3823EUH

DESCRIPTION

Demonstration circuit 1021A is a high efficiency synchronous step-down DC/DC converter with 4.5V to 16V input range. It can provide 2.5V output with 10A maximum current. The demo board features the LTC®3823EUH controller. The LTC3823 has a high accuracy +/-0.67% 0.6V reference voltage and provides many advanced functions including output tracking, differential output sensing, phase-lock loop frequency synchronization, programmable current limit, output over voltage protection and input under voltage lockout, power good monitor, programmable

soft start, selectable discontinuous operation mode or forced continuous mode at light load, and adjustable dead time between the top gate and bottom gate signals to optimize the efficiency.

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

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Table 1. Performance Summary (T$_A$ = 25°C)

PARAMETER	CONDITION	VALUE
Input Voltage Range		4.5V to 16V
Output Voltage	V$_{IN}$ = 4.5-16V, I$_{OUT}$ = 0A to 10A,	2.5V ±2%
Maximum load current	V$_{IN}$ = 4.5-16V	10A
Typical Output Ripple	V$_{IN}$ = 12V, I$_{OUT}$ = 10A (20MHz BW)	25mV$_{P-P}$
Typical Switching Frequency	V$_{IN}$ = 12V, I$_{OUT}$ = 10A	500kHz

OPERATING PRINCIPLES

The LTC3823 uses a constant on-time, valley current mode control architecture able to deliver very low duty cycles with fast transient response without requiring a sense resistor. The switching frequency of the converter can be selected by an external resistor Ron and is compensated for variations on input supply voltage. An internal phase-lock loop allows the controller to be synchronized to an external clock. Figure 3 gives the efficiency curves.

The LTC3823 has output voltage up and down tracking capability. Using the track/SS pin, the converter output can track another supply's output voltage. To select tracking function, place JP2 at TRACK, remove the soft start cap Css and connect a resistor divider

to the external voltage to be tracked. The tracking can be coincident or ratiometric, as shown in Figure 4.

The LTC3823 has true remote differential output sensing. When using remote sensing, connect Voutsense+ pin to the positive terminal of the remote output load, and connect Voutsense- pin to the negative terminal of the remote output load.

QUICK START PROCEDURE

Demonstration circuit 1021A is easy to set up to evaluate the performance of LTC3823. 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 Vin or Vout and GND terminals. See Figure 2 for proper scope probe technique.

1. Initial jumper positions:

JP1: DCM (discontinuous mode); JP2: SS (soft start)

2. With power off, connect the input power supply to +Vin (4.5V-16V) and GND (input return).

3. Connect the 2.5V load between Vout and GND. (Initial load: 0 A)

4. Connect the DVMs to the input and output.

5. Turn on the input power supply and check for the proper output voltages. Vout should be 2.5V+/-2%.

6. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage and other parameters.
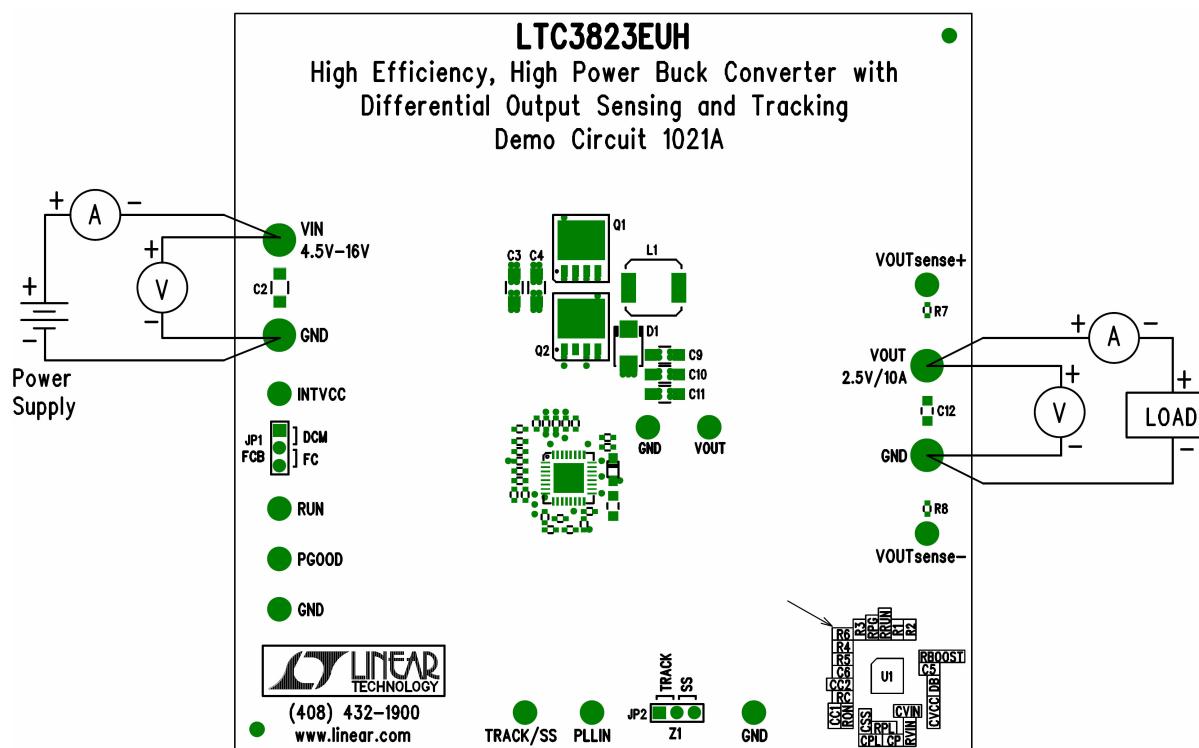
Figure 1. Proper Measurement Equipment Setup
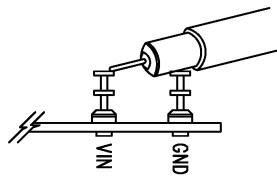
Figure 2. Measuring Input or Output Ripple

12V input to 2.5V output
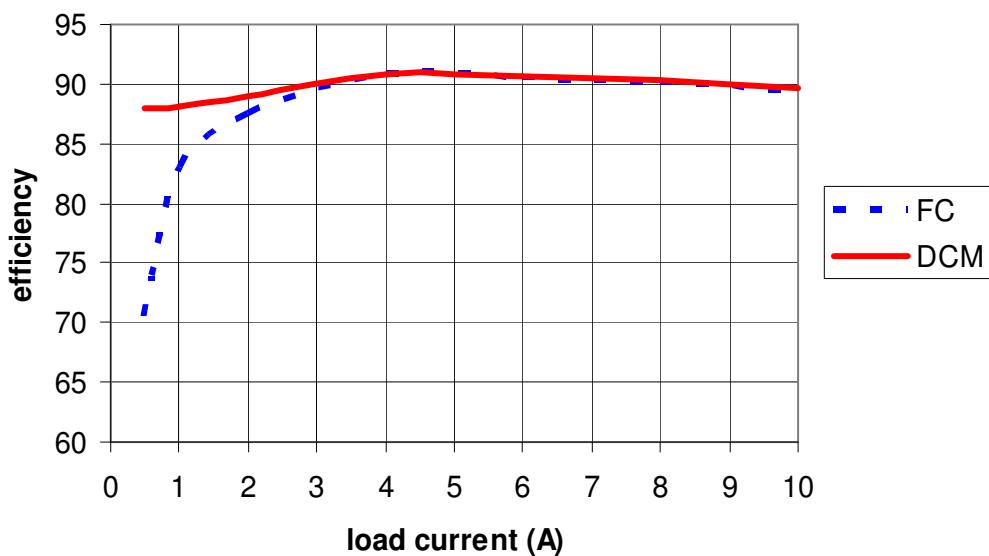
Figure 3. Efficiency vs load current
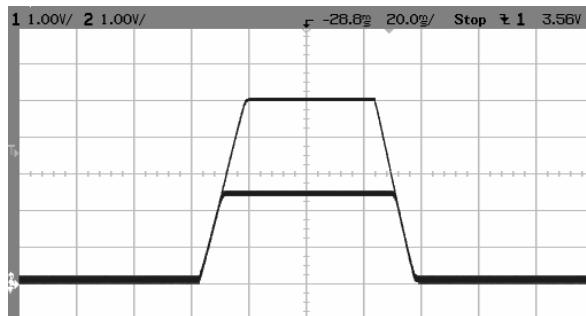
(a)   Coincident tracking
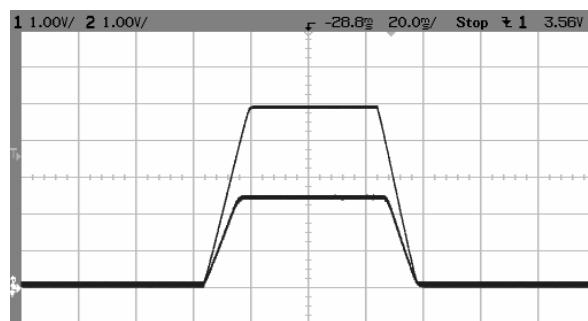
(b) Ratiometric tracking

Figure 4. (a)(b) Up/down output tracking. Upper waveform: external voltage; lower waveform: output voltage of the converter

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NOTES: UNLESS OTHERWISE SPECIFIED