

# 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  $\pm 0.67\%$  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 ( $T_A = 25^\circ\text{C}$ )**

PARAMETER	CONDITION	VALUE
Input Voltage Range		4.5V to 16V
Output Voltage	$V_{IN} = 4.5\text{--}16\text{V}$ , $I_{OUT} = 0\text{A to } 10\text{A}$ ,	$2.5\text{V} \pm 2\%$
Maximum load current	$V_{IN} = 4.5\text{--}16\text{V}$	10A
Typical Output Ripple	$V_{IN} = 12\text{V}$ , $I_{OUT} = 10\text{A}$ (20MHz BW)	25mV <sub>P-P</sub>
Typical Switching Frequency	$V_{IN} = 12\text{V}$ , $I_{OUT} = 10\text{A}$	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  $R_{on}$  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  $C_{ss}$  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  $V_{out-sense+}$  pin to the positive terminal of the remote output load, and connect  $V_{out-sense-}$  pin to the negative terminal of the remote output load.

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### 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.

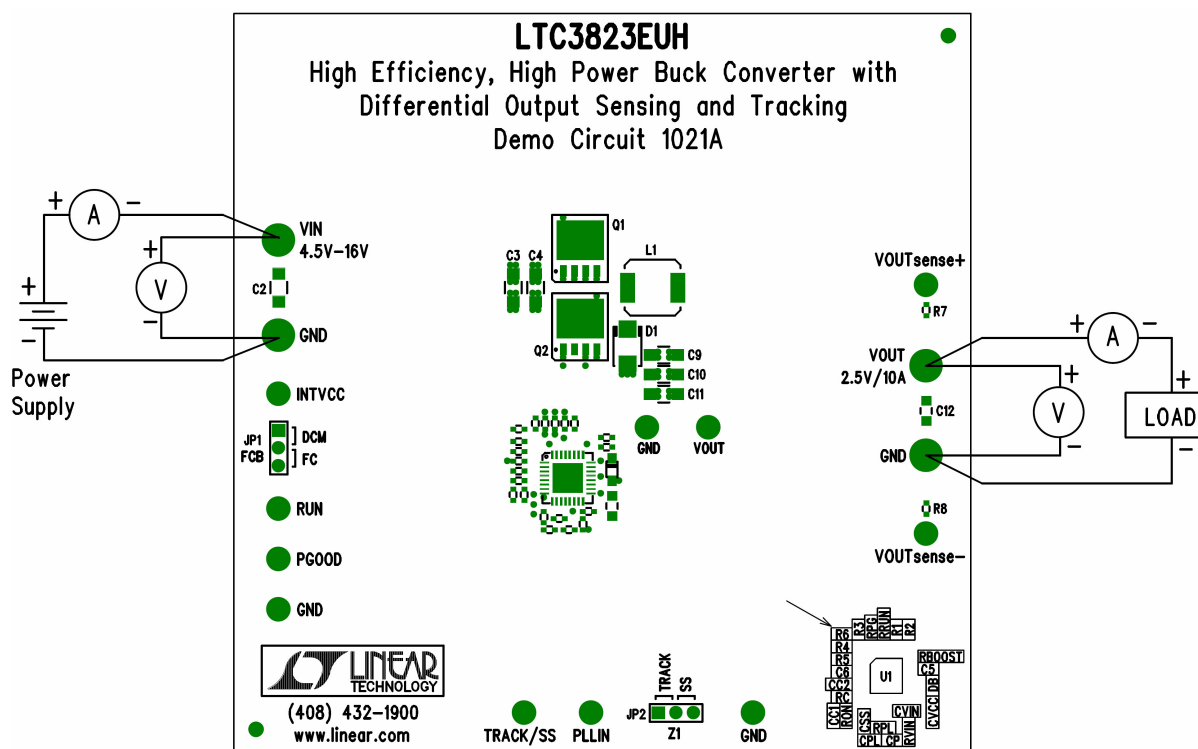


Figure 1. Proper Measurement Equipment Setup

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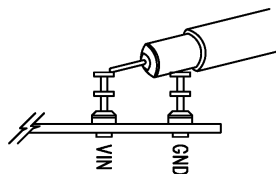


Figure 2. Measuring Input or Output Ripple

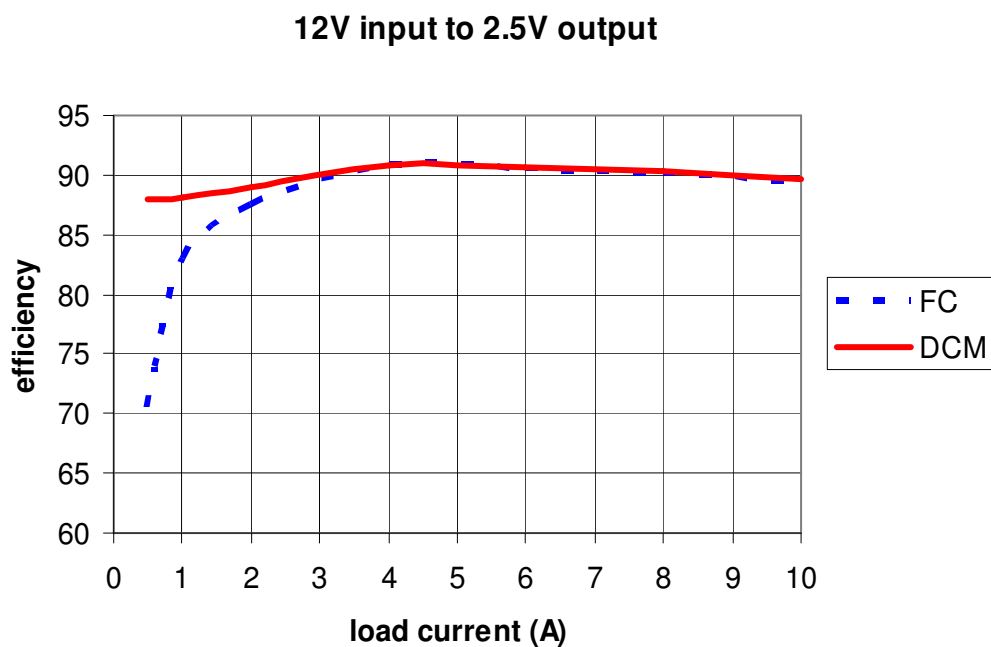
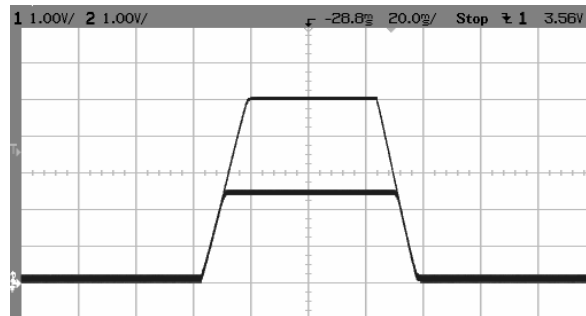


Figure 3. Efficiency vs load current

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(a) Coincident tracking

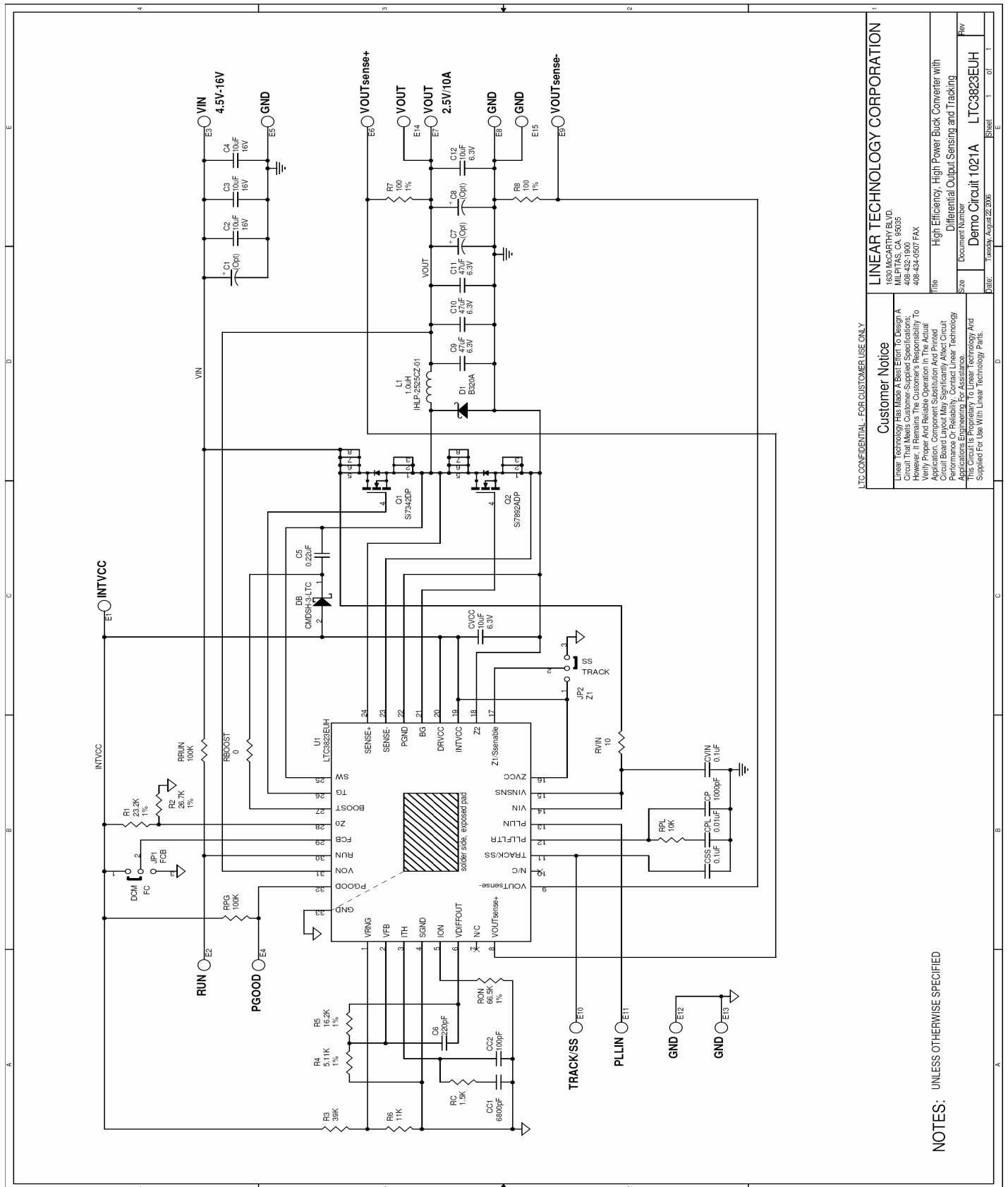


(b) Ratiometric tracking

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

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Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customer's responsibility to verify proper and reliable operation in the actual application. Linear Technology does not warrant the circuit board layout may significantly affect circuit performance or reliability. Contact Linear Technology Applications Engineering for assistance. This circuit is proprietary to Linear Technology and is supplied for use with Linear Technology parts.

LINEAR TECHNOLOGY CORPORATION  
1650 MCARDY BLVD.  
MILPITAS, CA 95035  
408-432-1900  
408-434-0507 FAX

NOTES: UNLESS OTHERWISE SPECIFIED

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