

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 993

500mA, 2.25 MHz SYNCHRONOUS STEP-DOWN REGULATOR

LTC3542

DESCRIPTION

Demonstration circuit 993A is a step-down converter, using the LTC3542 monolithic synchronous buck regulator. The DC993A has an input voltage range of 2.5V to 5.5V, and is capable of delivering up to 500 mA of output current in a small 2x2 mm DFN package. The output voltage of the DC993A can be set as low as 0.6V, the reference voltage of the LTC3542. At low load currents, the DC993A can operate in either noise sensitive applications, due to the capability of the LTC3542 to operate in pulse-skipping mode, or in high efficiency applications, because the LTC3542 can also operate in Burst Mode. Of course, in continuous mode, or large load current

applications, the DC993A is a high efficiency circuit - over 90% in some cases. The DC993A consumes only 27 uA during sleep mode operation, and during shut-down, it consumes at less than 1 uA. Because of the high switching frequency of the LTC3542 – nominal 2.25 MHz - the DC993A uses low profile surface mount components. These features, plus the LTC3542 coming in a either a tiny 2x2 mm 6-Lead DFN package or a small 6-Lead SOT package, make the DC993A an ideal circuit for use in battery-powered, hand-held applications. **Gerber files for this circuit are available. Call the LTC Factory.**

Table 1. Performance Summary ($T_A = 25^\circ\text{C}$)

PARAMETER	CONDITIONS	VALUE
Minimum Input Voltage		2.5V
Maximum Input Voltage		5.5V
Run/Shutdown	GND = Shutdown	
	V_{IN} = Run	
Output Voltage V_{OUT}	$V_{IN} = 2.5\text{V to } 5.5\text{V}$, $I_{OUT} = 0\text{A to } 500\text{ mA}$	1.2V $\pm 4\%$ (1.152V – 1.248V)
		1.5V $\pm 4\%$ (1.44V - 1.56V)
		1.8V $\pm 4\%$ (1.728V – 1.872V)
Typical Output Ripple V_{OUT}	$V_{IN} = 5\text{V}$, $I_{OUT} = 500\text{ mA}$ (20 MHz BW)	< 20mV _{p-p}
Output Regulation	Line	$\pm 1\%$
	Load	$\pm 1\%$
Nominal Switching Frequency		2.25 MHz
Operation Modes	Burst Mode - $V_{IN} = 3.6\text{V}$, $V_{OUT} = 1.8\text{V}$	$\sim 60\text{ mA} \pm 10\text{ mA}$
	Pulse-Skip - $V_{IN} = 3.6\text{V}$, $V_{OUT} = 1.8\text{V}$	$\sim 60\text{ mA} \pm 10\text{ mA}$

QUICK START PROCEDURE

Demonstration Circuit 993 is easy to set up to evaluate the performance of the LTC3542. For proper measurement equipment configuration, set up the circuit according to the diagram in **Figure 1**. Before proceeding to test, insert shunts into the OFF position of header JP3, which connects the RUN pin to ground (GND), and thus, shuts down the circuit, and the 1.2V output voltage header – JP4.

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 measurement technique.

With the DC993 set up according to the proper measurement and equipment in **Figure 1**, apply 3.3V at Vin (Do not hot-plug Vin or increase Vin over the rated maximum supply voltage of 5.5V, or the part may be damaged.). 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, or less, in shutdown.

Turn on the circuit by inserting the shunt in header JP3 into the ON position. The output voltage should

be regulating. Measure Vout - it should measure 1.2V +/- 2% (1.176V to 1.224V).

Vary the input voltage from 2.5V to 5.5V and adjust the load current from 0 to 500 mA. Vout should read between 1.2V +/- 4% (1.152V to 1.248V).

Measure the output ripple voltage at any output current level; it usually will measure less than 30 mVAC.

Observe the voltage waveform at the switch node. Verify the switching frequency is between 1.8 MHz and 2.7 MHz ($T = 0.555 \mu\text{s}$ and $0.37 \mu\text{s}$), and that the switch node waveform is rectangular in shape.

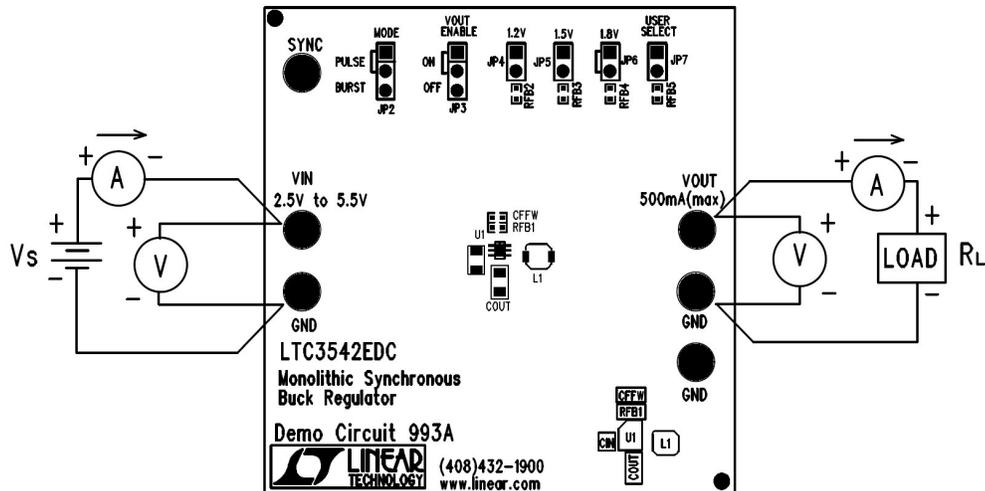
Insert header JP3 shunt into the OFF position and move the 1.2V Vout shunt into any of the two remaining output voltage option headers: 1.5V or 1.8V. Just as in the 1.2Vout test, the output voltage should read Vout +/- 2% tolerance under static line and load conditions, and +/- 1% tolerance under dynamic line and load conditions (+/- 2% total).

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

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Demonstration circuit 993 is a step-down converter based on the LTC3542 monolithic synchronous buck regulator. The DC993 is easy to set up and evaluate the performance of the LTC3542. Refer to Figure 1 for proper equipment set-up .



SET-UP DIAGRAM

Figure 1. Proper Equipment Measurement Set-Up

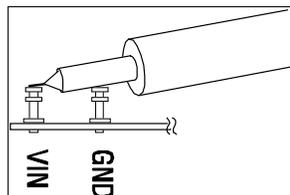
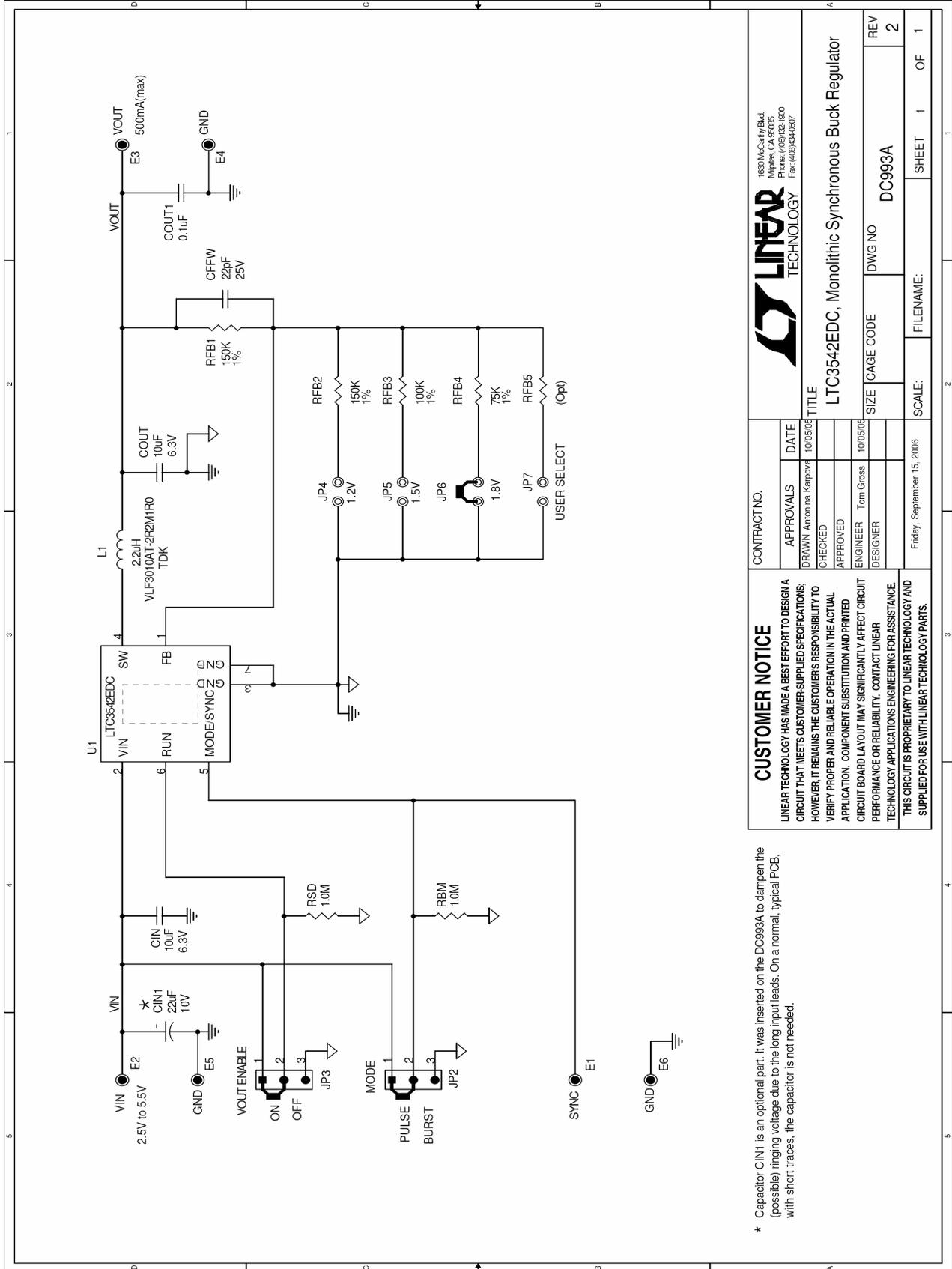


Figure 2. Measuring Input or Output Ripple

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* Capacitor CIN1 is an optional part. It was inserted on the DC993A 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.