DESCRIPTION

Demonstration circuit 1072B is a step-down converter, using the LTC3561A monolithic synchronous buck regulator. The DC1072B has an input voltage range of 2.5V to 5.5V, and is capable of delivering up to 1A of output current. The output voltage of the DC1072B can be set as low as 0.8V, the reference voltage of the LTC3561A, and can go as high as 5V. At light load currents, the DC1072B operates in pulse-skipping mode - ideal for noise sensitive applications. Of course, in large load current applications, the DC1072B operates in continuous mode, providing high efficiency - over 95%. The DC1072B consumes less than 60 uA of quiescent current during sleep operation, and during shutdown, it consumes less than 1 uA. The DC1072B has a standard operating frequency of 1 MHz, but can be adjusted to frequencies as high as 4 MHz. Because of the high switching frequency of the DC1072B, small, low profile surface mount components are used in the circuit. These features, plus the LTC3561A coming in a small 8-Lead DFN package, make the DC1072B a perfect match for battery-powered, hand-held applications.

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

Table 1.

Performance Summary (T_A = 25°C)

PARAMETER	CONDITIONS	VALUE
Minimum Input Voltage		2.5V
Maximum Input Voltage		5.5V
Output Voltage V_{OUT} Regulation	V_{IN} = 2.5V to 5.5V, I_{OUT} = 0A to 1A	1.2V ±4% (1.152V to 1.248V) 1.5V ±4% (1.44V to 1.56V) 1.8V ±4% (1.728V to 1.872V)
Typical Output Ripple V_{OUT}	V_{IN} = 5V, I_{OUT} = 1A (20 MHz BW)	<20mV_{P-P}
Operation Mode	Pulse-Skipping - V_{IN} = 3.3V, V_{OUT} = 1.8V	<100mA ±0.1A%
Nominal Switching Frequency		1 MHz

QUICK START PROCEDURE

Demonstration Circuit 1072B is easy to set up to evaluate the performance of the LTC3561A. For proper measurement equipment configuration, set up the circuit according to the diagram in **Figure 1**. Before proceeding to test, insert shunts into JP1 OFF position, which connects the RUN pin to ground (GND), and thus, shuts down the circuit, and the 1.2V position of JP2.

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. With the DC1072B 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 10 uA, or less, in shutdown.
2. Turn on the circuit by inserting the shunt in header JP1 into the ON position. The output voltage should be regulating. Measure Vout - it should measure 1.2V +/- 2% (1.176V to 1.224V).
3. Vary the input voltage from 2.5V to 5.5V and adjust the load current from 0 to 1A. Vout should read between 1.2V +/- 4% (1.152V to 1.248V).
4. Measure the output ripple voltage at any output current level; it usually will measure less than 20 mVAC.
5. Observe the voltage waveform at the switch node. Verify the switching frequency is between 850 kHz and 1.15 MHz (T = 1.176 us and 0.87 us), and that the switch node waveform is rectangular in shape.

Insert jumper JP1 shunt into the OFF position and move the 1.2V Vout shunt into any of the remaining output voltage options: 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 (connecting the RUN pin to ground) by inserting the shunt in header JP1 into the OFF (upper) position.

Connection Diagram

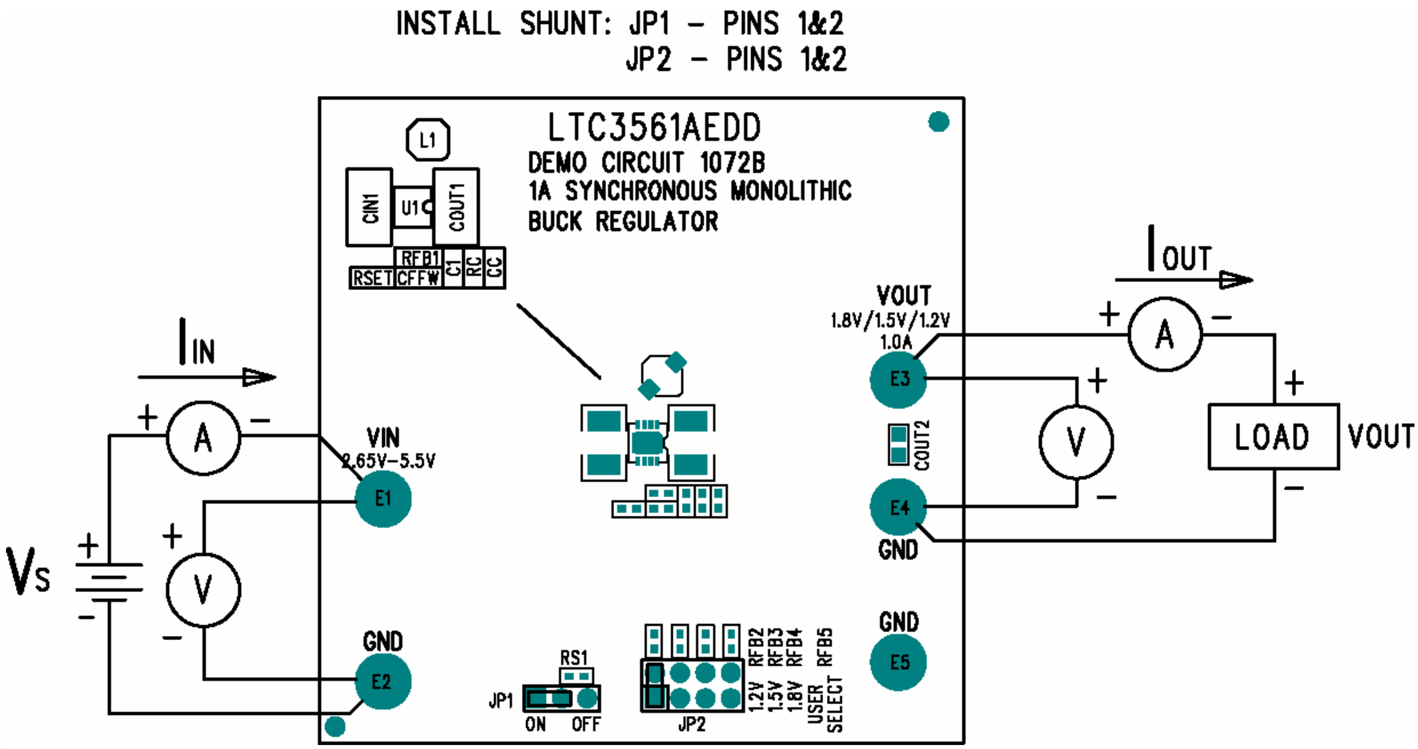


Figure 1. Proper Measurement Equipment Setup

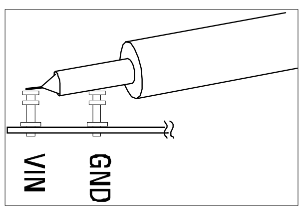


Figure 2. Measuring Input or Output Ripple

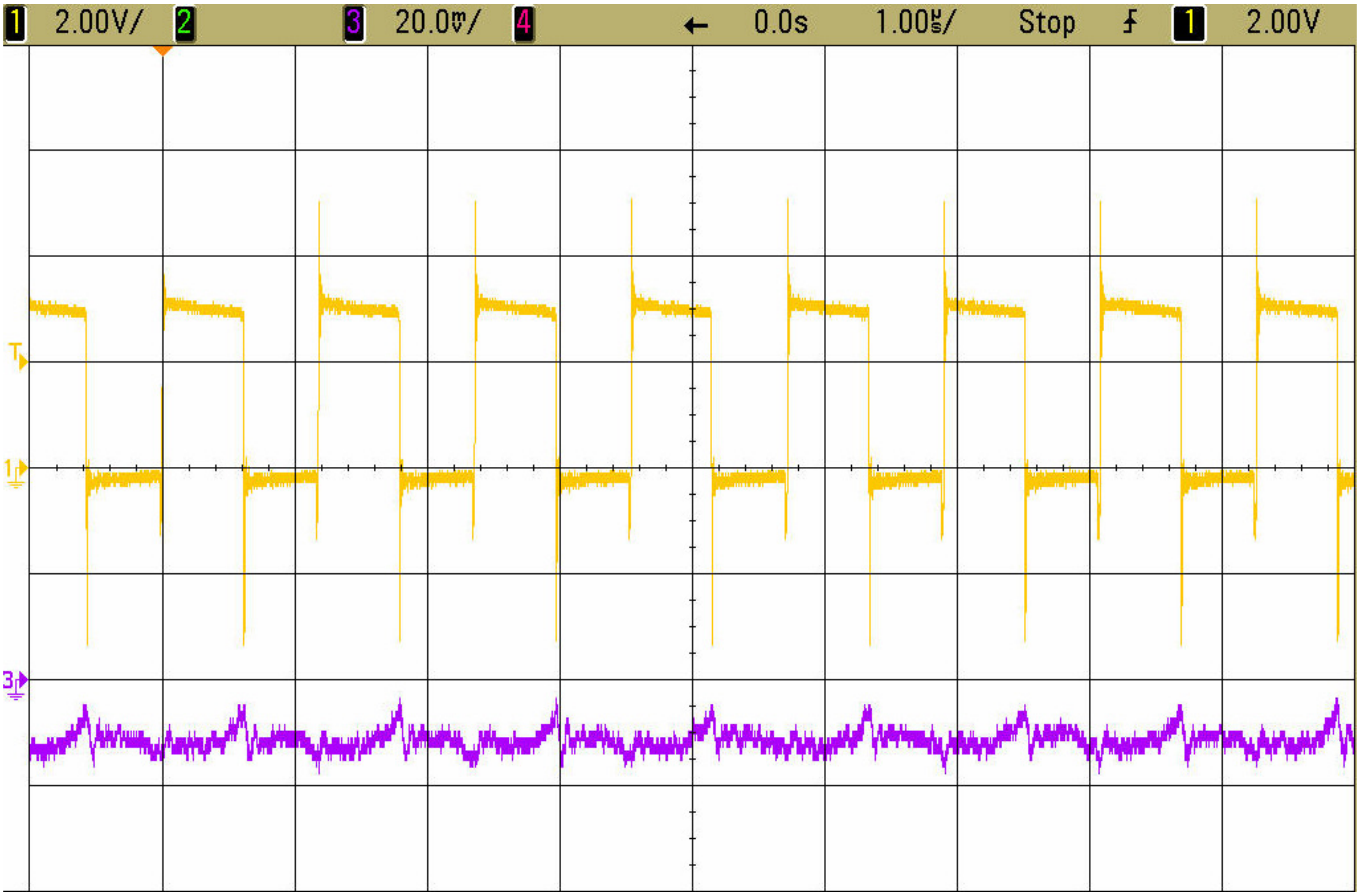


Figure 3. Switching Operation
V_{IN} = 3.3V, V_{OUT} = 1.5V, 1A Output Current
Trace 1: Switch Voltage (2V/div)
Trace 3: Output Voltage (20mV/div AC)

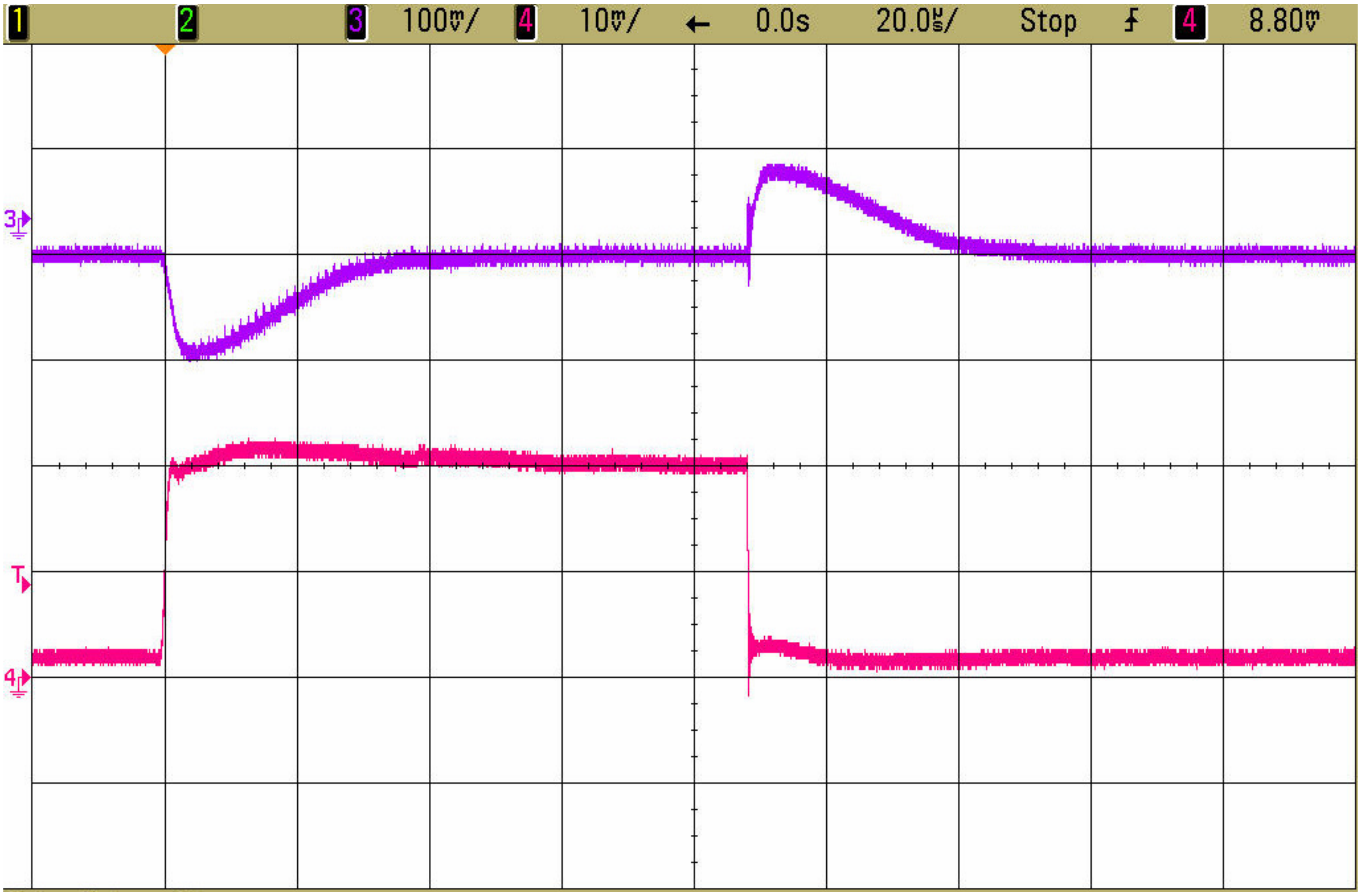
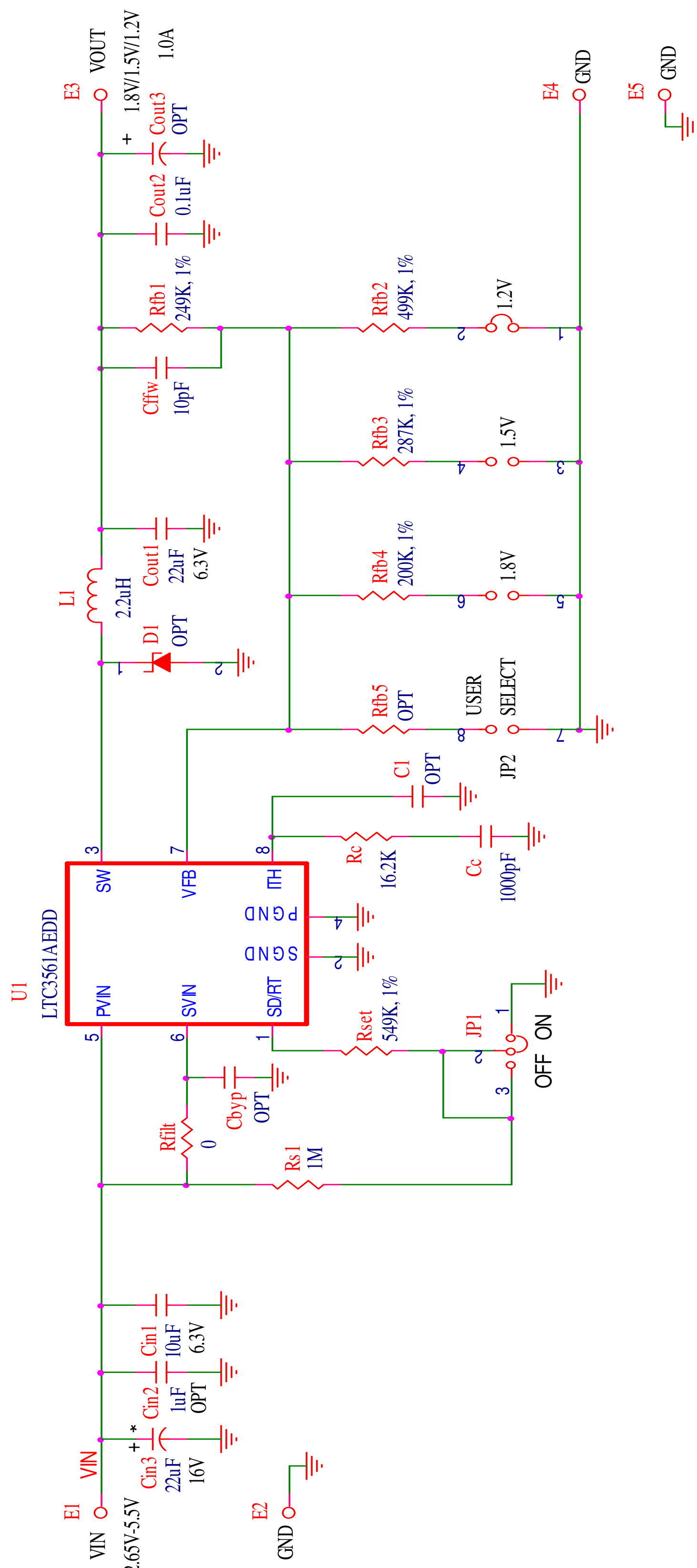


Figure 4. Load Step Response

V_{IN} = 3.3V, V_{OUT} = 1.5V, 900mA Load Step (0.1A <-> 1A)

Trace 3: Output Voltage (100mV/div AC)

Trace 4: Output Current (500 mA/div)


E3
VOUT
1.8V/1.5V/1.2V
1.0A
Cout3
OPT
Cout2
0.1uF
Rfb1
249K, 1%
Cffw
10pF
E4
GND
E5
GND
Rfb2
499K, 1%
1.2V
Rfb3
287K, 1%
1.5V
Rfb4
200K, 1%
1.8V
Rfb5
OPT
USER
SELECT
JP2
L1
2.2uH
Cout1
22uF
6.3V
D1
OPT
C1
OPT
Rc
16.2K
Cc
1000pF
U1
LTC3561AEDD
SW
VFB
ITH
PGND
SGND
PVIN
SVIN
SD/RT
Rset
549K, 1%
JP1
ON
OFF
Cbyp
OPT
Rfilt
0
Rs1
1M
Cin1
10uF
6.3V
Cin2
1uF
OPT
Cin3
22uF
16V
VIN
E1
VIN
2.65V-5.5V
E2
GND