QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1180
DUAL MONOLITHIC SYNCHRONOUS 600MA 1.5 MHZ BUCK DC/DC REGULATOR

LTC3407A

DESCRIPTION

Demonstration circuit DC1180 is a dual output regulator consisting of two identical constant-frequency step-down converters, based on the LTC3407A monolithic dual synchronous buck regulator. The DC1180 has an input voltage range of 2.5V to 5.5V, and either output is capable of delivering up to 600 mA of output current. In Burst Mode™ operation, which is the mode of low load current operation for the LTC3407A, the DC supply current is typically only 25 uA (per channel) at no load, and less than 1 uA in shutdown. The DC1180A also exhibits low output ripple voltage during Burst Mode™ operation, due to the improved performance of the LTC3407A. The DC1180 is a very efficient circuit: up to 96% for either circuit. The LTC3407A comes in either a small 10 Pin DD10 or MSOP package, which both have an exposed pad on the bottom-side of the IC for better thermal performance. These features, plus the nominal operating frequency of 1.5 MHz (allowing the exclusive use of low profile surface mount components), make the DC1180 demo board 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		2.5V
Maximum Input Voltage		5.5V
Output Voltage V_{OUT1}	V_{IN} = 2.5V to 5.5V, I_{OUT1} = 0A to 600 mA	1.2V ±4% (1.152V – 1.248V) 1.5V ±4% (1.44V – 1.56V) 1.8V ±4% (1.728V – 1.872V)
Typical Output Ripple V_{OUT1}	V_{IN} = 5V, I_{OUT1} = 600 mA (20 MHz BW)	< 20mV$_{P-P}$
Output Regulation	Line	±1%
	Load	±1%
Output Voltage V_{OUT2}	V_{IN} = 2.5V to 5.5V, I_{OUT2} = 0A to 600 mA	2.5V ±4% (2.4V – 2.6V) 3.3V ±4% (3.168V – 3.432V)
Typical Output Ripple V_{OUT2}	V_{IN} = 5V, I_{OUT2} = 600 mA (20 MHz BW)	< 20mV$_{P-P}$
Output Regulation	Line	±1%
	Load	±1%
Nominal Switching Frequency		1.5 MHz

QUICK START PROCEDURE

The DC1180 is easy to set up to evaluate the performance of the LTC3407A. For a proper measurement equipment configuration, set up the circuit according to the diagram in Figure 1.

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 the probe measurement diagram in Figure 2 for proper scope probe technique.

Please follow the procedure outlined below for proper operation.

1. Connect the input power supply to the Vin and GND terminals. Connect the loads between the Vout and GND terminals. Refer to Figure 1 for the proper measurement equipment setup.
2. Before proceeding to operation, insert shunts XJP1 and XJP2 into the OFF positions. Also inserts shunts into the 1.8V Vout1 voltage option of JP3, and into the 3.3V Vout2 voltage option of JP4.
3. Apply 5V at Vin, and turn on Vout1 and Vout2 by changing shunts XJP1 and XJP2 from the OFF positions to the ON positions. Both output voltages should be within a tolerance of +/- 2% of their regulated output voltage.
4. Vary the input voltage from 5V to 0.5V above the output voltage (If Vout2 is off, then the minimum input voltage limit is 2.5V.). Both output voltages should be within +/- 3% tolerance.
5. Vary the load current, of each output, from 0 to 600mA. Each output voltage should be within a tolerance of +/- 4%.
6. Set the load current of both outputs at 600 mA and measure the output ripple voltage of each regulator (Refer to Figure 2 for proper measurement technique); they should measure less than 20 mVAC each. Also, observe the voltage waveform at either switch node (pin 4 for reg.1 and pin 7 for reg.2) of each regulator. The switching frequencies should be between 1.2 MHz and 1.8 MHz (T = 833 ns and 555 ns).
7. When finished, insert shunts into the OFF position(s) of JP1 and JP2. To test and evaluate the other voltage options, move the shunts in JP3 and JP4 into any of the remaining output voltage options – 1.2V (JP3) or 1.5V (JP3) for Vout1 and 2.5V (JP4) for Vout2. Just as in the 1.8V, Vout1, or 3.3V, Vout2, voltage options, the new output voltages should measure +/- 2% tolerance for static line and load conditions and +/- 2% tolerance under dynamic line and load conditions (4% total).

   When finished, turn off the circuits by inserting shunts XJP1 and XJP2 into the OFF positions, and disconnect the power.

Warning - If the power for the demo board is carried in long leads, the input voltage at the part could “ring”, which could affect the operation of the circuit or even exceed the maximum voltage rating of the IC (which, of course, may damage the IC). To eliminate the ringing, a small tantalum capacitor (AVX part # TAJW476M010) has been inserted on the pads between the input power and return terminals on the bottom of the demo board. The (greater) ESR of the tantalum capacitor 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.

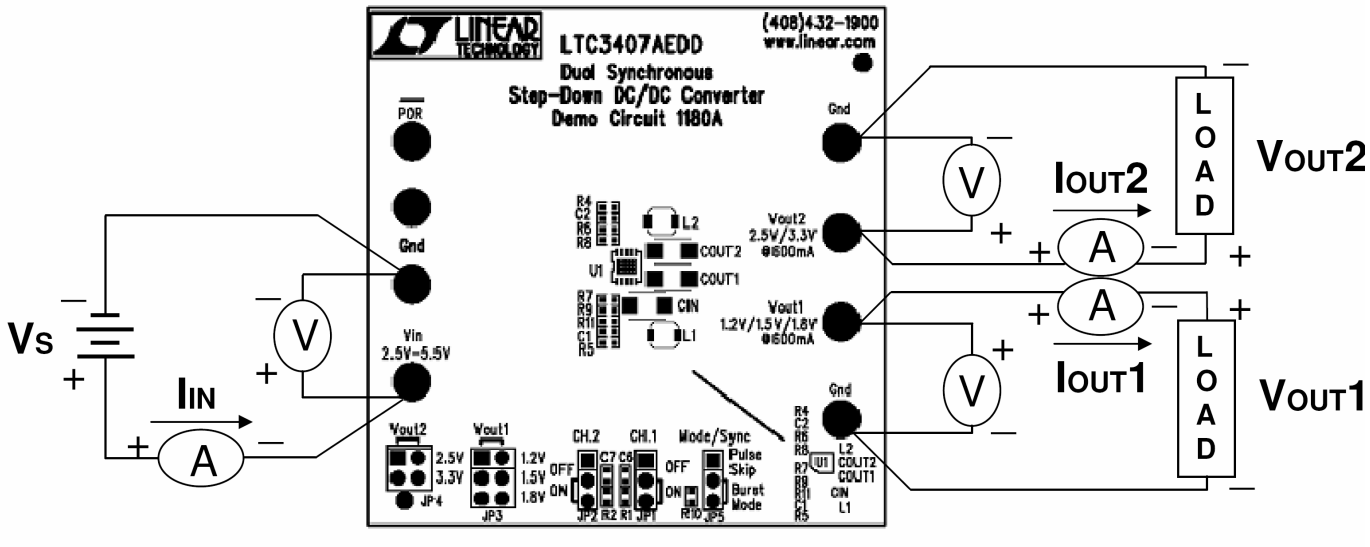


Figure 1. Proper Measurement Equipment Setup

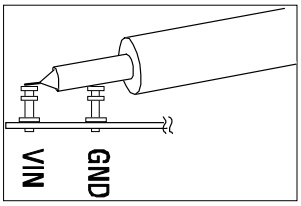
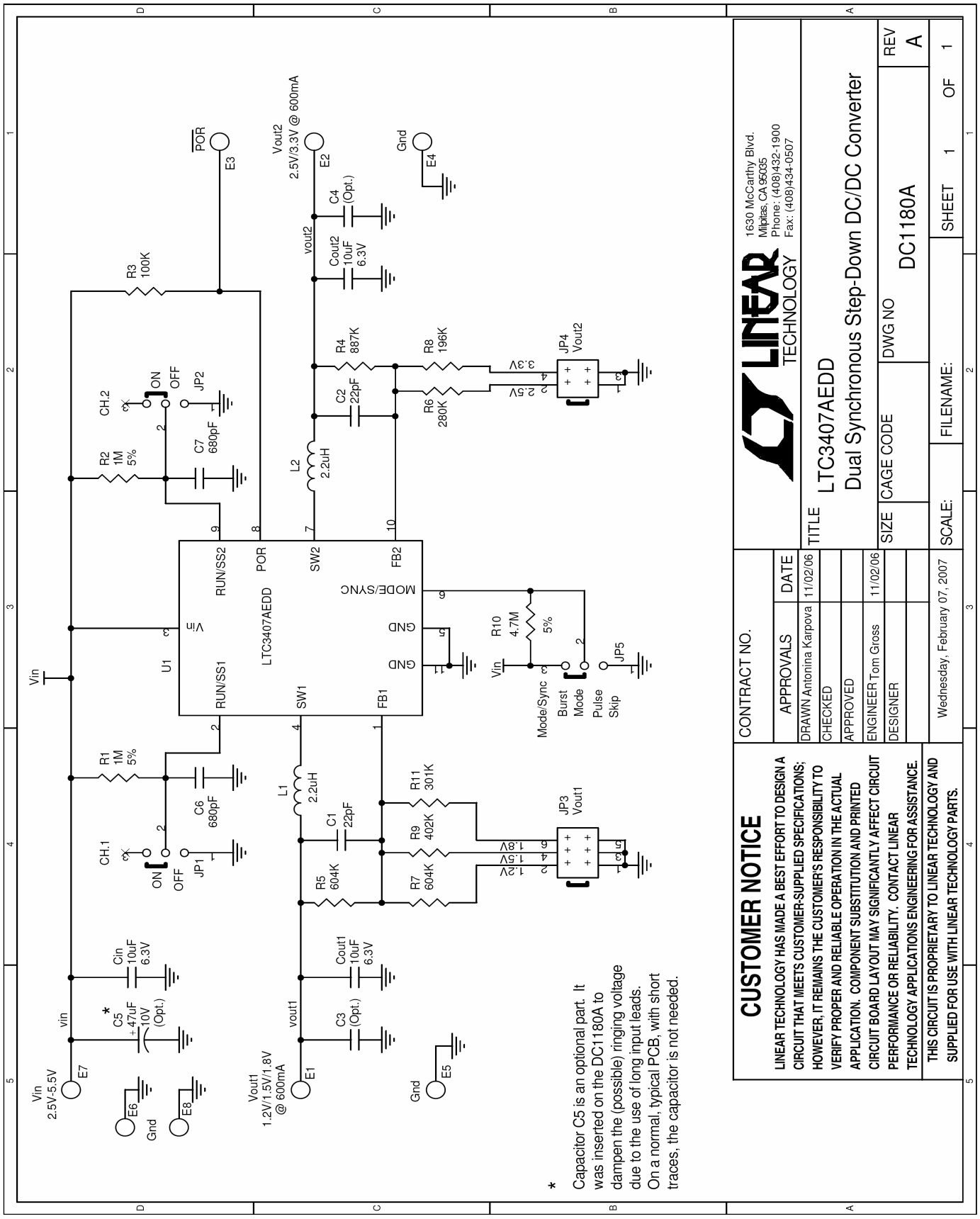


Figure 2. Measuring Input or Output Ripple


Vin
2.5V-5.5V
E7
vin
Cin
10uF
6.3V
*
C5
47uF
10V
(Opt.)
E6
Gnd
E8
CH.1
ON
OFF
JP1
R1
1M
5%
C6
680pF
CH.2
ON
OFF
JP2
R2
1M
5%
C7
680pF
R3
100K
POR
E3
U1
LTC3407AEDD
Vin
RUN/SS1
RUN/SS2
SW1
POR
SW2
FB1
FB2
GND
GND
MODE/SYNC
L1
2.2uH
L2
2.2uH
C1
22pF
C2
22pF
R4
887K
R5
604K
R7
604K
R9
402K
R11
301K
R8
196K
R6
280K
R10
4.7M
5%
Vin
Mode/Sync
Burst
Mode
Pulse
Skip
JP5
JP3
Vout1
1.2V
1.5V
1.8V
JP4
Vout2
2.5V
3.3V
vout1
Cout1
10uF
6.3V
C3
(Opt.)
Vout1
1.2V/1.5V/1.8V
@ 600mA
E1
Gnd
E5
vout2
Cout2
10uF
6.3V
C4
(Opt.)
Vout2
2.5V/3.3V @ 600mA
E2
Gnd
E4
* Capacitor C5 is an optional part. It was inserted on the DC1180A to 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.
CUSTOMER NOTICE
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. COMPONENT SUBSTITUTION AND PRINTED 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 SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
DATE
DRAWN Antonina Karpova 11/02/06
CHECKED
APPROVED
ENGINEER Tom Gross 11/02/06
DESIGNER
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
TITLE
LTC3407AEDD
Dual Synchronous Step-Down DC/DC Converter
SIZE
CAGE CODE
DWG NO
DC1180A
REV
A
SCALE:
FILENAME:
SHEET 1 OF 1
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