QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1336
DUAL SYNCHRONOUS, 1.5/1A, 4 MHZ STEP-DOWN DC/DC REGULATOR

LTC3417A-2

DESCRIPTION

Demonstration circuit DC1336 is a dual output regulator consisting of two constant-frequency step-down converters, based on the LTC3417A-2 monolithic dual synchronous buck regulator. The DC1336 has an input voltage range of 2.25V to 5.5V, with one regulator capable of delivering up to 1.5A of output current and the other regulator capable of delivering up to 1A of output current. The DC1336 can operate in either Burst Mode™ or Pulse-Skipping operation. In shutdown, the DC1336 can run off of less than 1 uA total. The DC1336 is a very efficient circuit: up to 94% for either circuit. The LTC3417A-2 comes in a 16 Pin DFN package, which has 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 DC1336 demo board an ideal circuit for use in battery-powered, hand-held applications. **Gerber files for this circuit are available. Call the LTC Factory.**

QUICK START PROCEDURE

The DC1336 is easy to set up to evaluate the performance of the LTC3417A-2. For a proper measurement equipment configuration, set up the circuit according to the diagram in Figure 2.

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 Measurement Equipment Set-up diagram in Figure 1 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 jumper shunts XJP1 and XJP4 into the OFF positions, shunt XJP2 into the IN PHASE position, shunt XJP3 into the PULSE (SKIP) position, shunt XJP8 into the 1.5 MHz position, shunt XJP6 into the Vout1 voltage options of choice: 1.2V, 1.5V, or 1.8V, and a shunt into the Vout2 voltage option of choice: 2.5V (jumper JP5) or 3.3V (jumper JP7).

3. Apply 5V at Vin. Measure both Vouts; they should read 0V. If desired, one can measure the shutdown supply current at this point. The supply current will be be less than 100 uA in shutdown, with most of the current due to the optional 100 kohm pull-up resistor of the Power-On Reset (POR) feature.

4. Turn on Vout1 and Vout2 by changing shunts XJP1 and XJP4 from the OFF positions to the ON positions. Both output voltages should be within a tolerance of +/- 2.5%.

5. Vary the input voltage from 5V to 0.5V above the output voltage (If Vout2 is off, then the minimum input voltage limit is 2.25V.). Both output voltages should be within +/- 4% tolerance.

6. Vary the Vout1 load current from 0 to 1.5A, and the Vout2 load current from 0 to 1A. Each output voltage should be within a tolerance of +/- 5%.

7. Set the load current of both outputs between 500 mA and the max. rated output current, and then measure each output ripple voltage (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 (pins 15 – reg.1 and 10 – reg.2) of each regulator. The switching frequencies should be between 1.2 MHz and 1.8 MHz (T = 0.833 us and 0.555 us). To realize 1 MHz operation, change the shunt position on jumper JP8. In all cases, both switch node waveforms should be rectangular in shape, and in phase with each other. Change the shunt position on header JP2 to set the switch waveforms 180 degrees out of phase (with respect to each other). This operation reduces the RMS input current. To operate the ckt.s in Burst Mode™, change the shunt in header JP3 to the Burst Mode™ position.

8. When finished, insert shunts XJP1 and XJP4 to the OFF position(s) 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. To eliminate the ringing, insert a small tantalum capacitor (for instance, AVX part # TAJW686M010) on the pads between the input power and return terminals on the bottom of the demo board. The (greater) ESR of the tantalum 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.

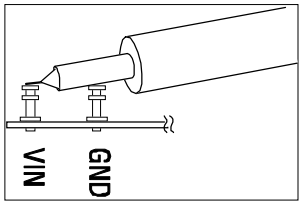
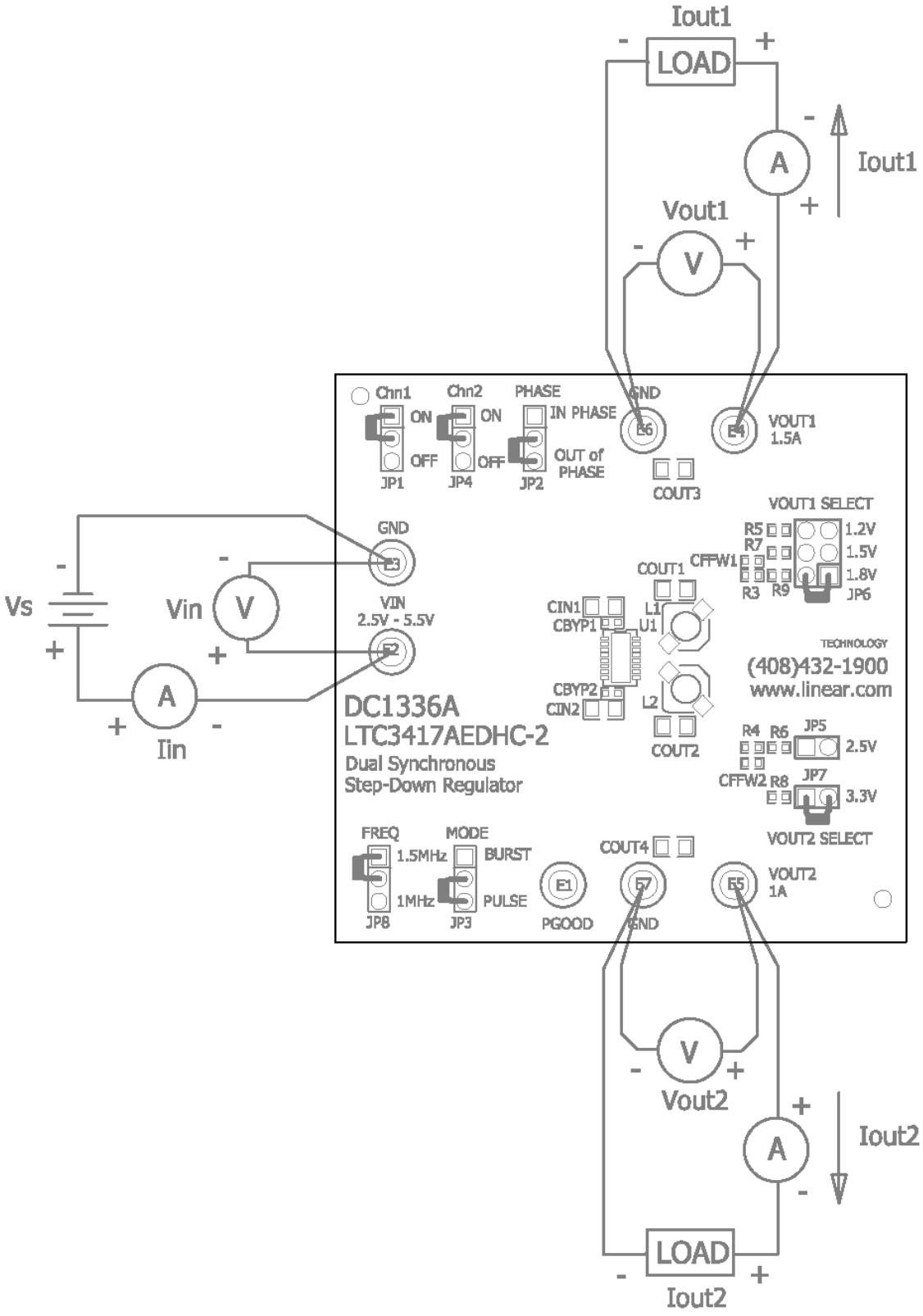
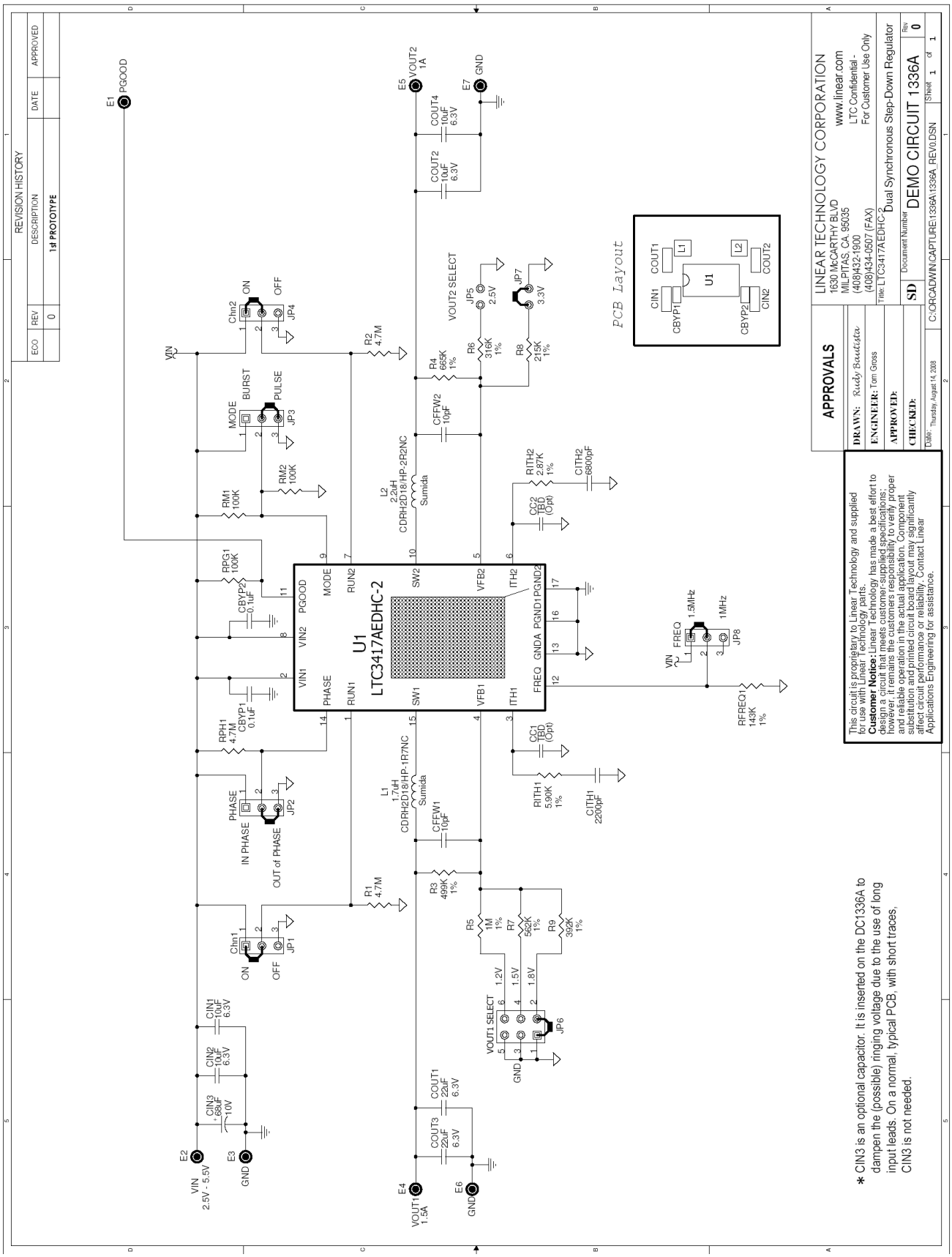


Figure 1. Measuring Input or Output Ripple

Table 1. Performance Summary (T_A = 25°C)

PARAMETER		CONDITIONS	VALUE
Minimum Input Voltage			2.25V
Maximum Input Voltage			5.5V
Run/Shutdown		RUN(1, 2) pin = GND	Shutdown
		RUN(1, 2) pin = V_{IN}	Operating
Output Voltage V_{OUT1}		V_{IN} = 2.25V to 5.5V, I_{OUT1} = 0A to 1.5A	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} = 1.5 A (20 MHz BW)	< 30mV_{P-P}
Output Regulation V_{OUT1}		Line	±1%
		Load	±1.5%
Output Voltage V_{OUT2}		V_{IN} = 2.25V to 5.5V, I_{OUT2} = 0A to 1A	2.5V ±4% (2.4V – 2.6V)
			3.3V ±4% (3.168V – 3.432V)
Typical Output Ripple V_{OUT2}		V_{IN} = 5V, I_{OUT2} = 1A (20 MHz BW)	< 30mV_{P-P}
Output Regulation V_{OUT2}		Line	±1%
		Load	±1.5%
Nominal Switching Frequencies		FREQ Pin connected to R_T of 143k	1 MHz
		FREQ Pin = V_{IN}	1.5 MHz
Operation Modes	Burst Mode	Channel 1: Vin = 5V, Vout1 = 1.8V	Iout1 = 900 mA
		Channel 2: Vin = 5V, Vout2 = 3.3V	Iout2 = 500 mA
	Pulse-Skip	Channel 1: Vin = 5V, Vout1 = 1.8V	Iout1 = 500mA
		Channel 2: Vin = 5V, Vout2 = 3.3V	Iout2 = 400 mA
Phase		Phase Pin = V_{IN}	In Phase
		Phase Pin = GND	Out-of-Phase


Iout1
LOAD
A
Iout1
Vout1
V
Chn1
Chn2
PHASE
ON
OFF
IN PHASE
OUT of PHASE
JP1
JP4
JP2
GND
E6
E4
VOUT1
1.5A
COUT3
VOUT1 SELECT
R5
R7
CFFW1
R3
R9
1.2V
1.5V
1.8V
JP6
COUT1
CIN1
CBYP1
U1
L1
L2
CBYP2
CIN2
COUT2
TECHNOLOGY
(408)432-1900
www.linear.com
DC1336A
LTC3417AEDHC-2
Dual Synchronous
Step-Down Regulator
R4
R6
JP5
2.5V
CFFW2
R8
JP7
3.3V
VOUT2 SELECT
FREQ
MODE
1.5MHz
1MHz
BURST
PULSE
JP8
JP3
COUT4
E1
E7
E5
PGOOD
GND
VOUT2
1A
Vs
Vin
Iin
E3
E2
VIN
2.5V - 5.5V
V
A
Vout2
Iout2
LOAD
Iout2


REVISION HISTORY
ECO REV DESCRIPTION DATE APPROVED
0 1st PROTOTYPE
U1
LTC3417AEDHC-2
VIN1 VIN2 PGOOD MODE RUN2 SW2 VFB2 ITH2
PHASE RUN1 SW1 VFB1 ITH1
FREQ GNDA PGND1 PGND2
L1 1.7uH CDRH2D18/HP-1R7NC Sumida
L2 2.2uH CDRH2D18/HP-2R2NC Sumida
VIN 2.5V - 5.5V
VOUT1 1.5A
VOUT2 1A
PGOOD
GND
PCB Layout
APPROVALS
DRAWN: Rudy Bautista
ENGINEER: Tom Gross
APPROVED:
CHECKED:
LINEAR TECHNOLOGY CORPORATION
1630 McCARTHY BLVD
MILPITAS, CA 95035
(408)432-1900
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LTC Confidential - For Customer Use Only
Title: LTC3417AEDHC-2 Dual Synchronous Step-Down Regulator
Document Number DEMO CIRCUIT 1336A
Rev 0
Date: Thursday, August 14, 2008
Sheet 1 of 1
C:\ORCADWIN\CAPTURE\1336A\1336A_REV0.DSN
This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.
Customer Notice: Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customers 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 Applications Engineering for assistance.
* CIN3 is an optional capacitor. It is inserted on the DC1336A to dampen the (possible) ringing voltage due to the use of long input leads. On a normal, typical PCB, with short traces, CIN3 is not needed.