3.5A,25V Step-down Switching Regulator with SYNC Function

DESCRIPTION

Demonstration circuit 1316 is a monolithic step-down DC/DC switching regulator featuring LT1913. The LT1913 can be synchronized over a 250 KHz to 2 MHz range. The demo board is designed for 5V output from a 6.5V to 25V input. The wide input range of the LT1913 allows a variety of input sources. The typical sources are automotive batteries, wall adaptors and industrial supplies.

An optional EMC filter at the input is provided on the bottom of the board, which greatly reduces the conductive EMI noise at the input side. Customers can use this optional circuit by cutting the input trace on the bottom of the board and install the components. The current mode control scheme creates fast transient response and good loop stability. The gate drive of the internal switch is boosted to a voltage that is higher than the Vin to ensure saturation of the switch. The LT1913's integrated boost diode reduces the parts count. The

RUN/SS pin can be used to set the part in micropower shutdown mode, reducing the supply current to less than 1uA. The RUN/SS pin can also be used to program soft start. In this mode, the RUN/SS pin is driven through an external RC filter to create a voltage ramp on this pin. The soft start function reduces the input current surge during start-up.

The LT1913 datasheet gives a complete description of the part, operation and application information. The datasheet must be read in conjunction with this quick start guide for demo circuit 1316.

Note: It is best to ground the SYNC pin if the SYNC function is not being used.

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

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Performance Summary for Step-down Switching Regulator (T_A = 25°C)

PARAMETER FOR BUCK REGULATOR	CONDITION	VALUE
Minimum Input Voltage		6.5V
Maximum Input Voltage		25V
Output Voltage V_{OUT}		5V +/- 4%
Maximum Output Current		3.5A
Typical Switching Frequency		800kHz

QUICK START PROCEDURE

Demonstration circuit 1316 is easy to set up to evaluate the performance of the LT1913. 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. Place JP1 on the RUN position.

2. With power off, connect the input power supply to Vin and GND.

3. Turn on the power at the input.

4. Check for the proper output voltage.

> **NOTE.** If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

5. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

6. An external clock can be added to the SYNC pin when SYNC function is used. See synchronization section in the datasheet for details.
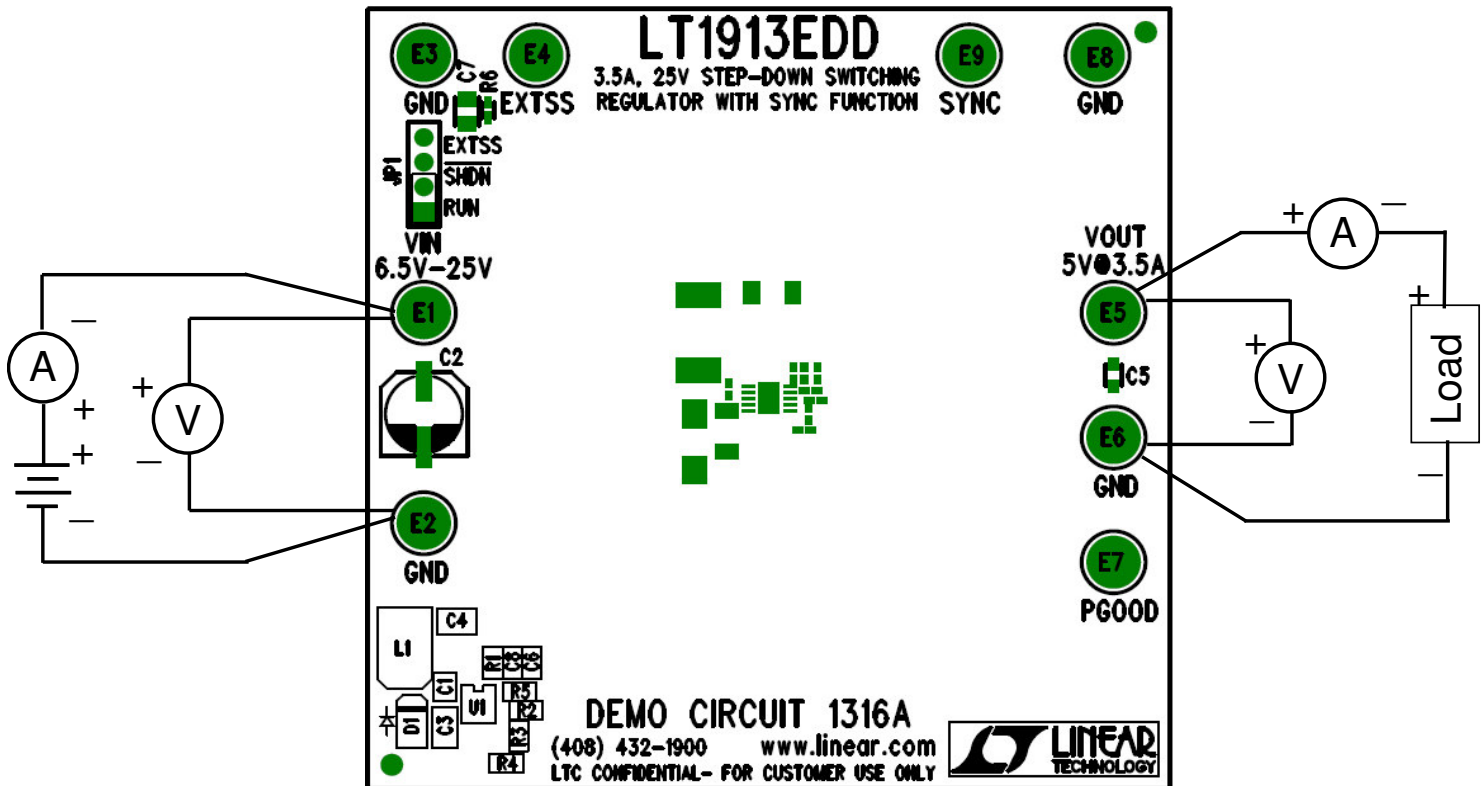

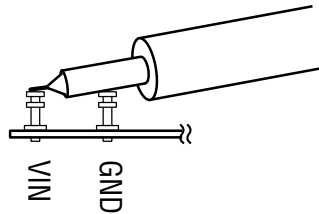**Figure 1. Proper Measurement Equipment Setup**
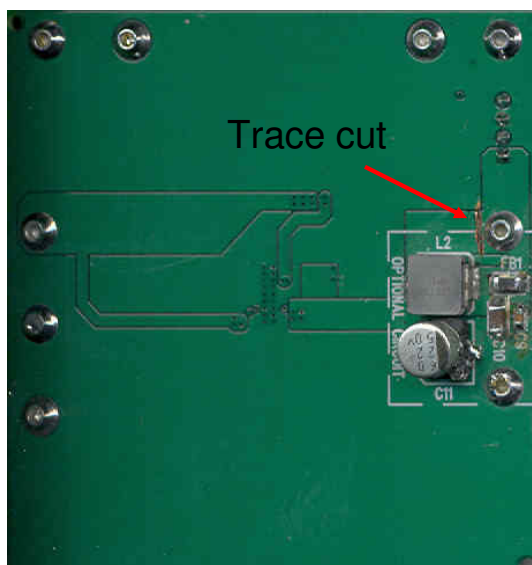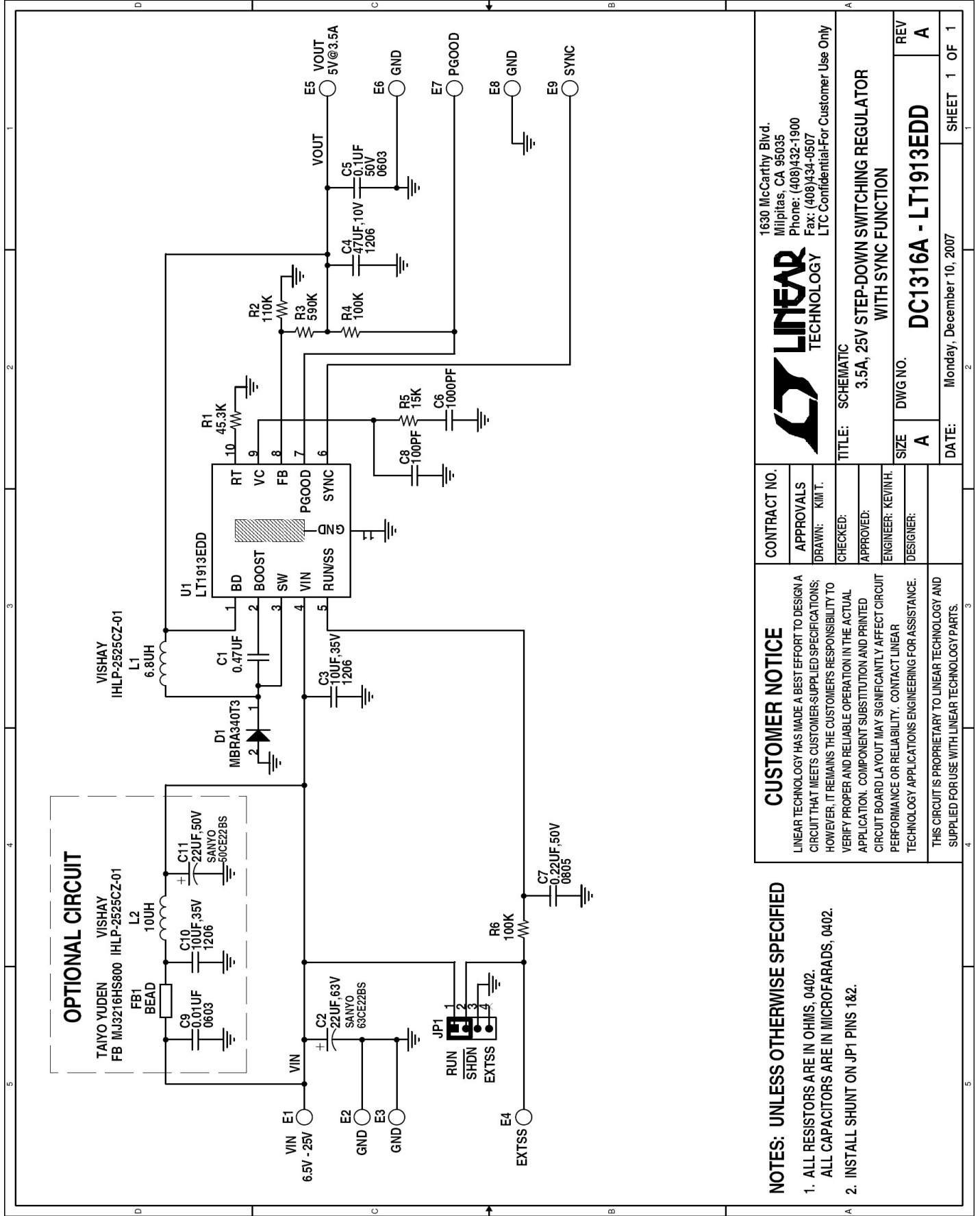

Figure 2. Measuring Input or Output Ripple

Figure 3. The Bottom of the demo Board with the Optional Circuit and the Input Trace Cut

LT1913

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OPTIONAL CIRCUIT

TAIYO YUDEN
FB MJ3216HS800
FB1 BEAD

VISHAY
IHLP-2525CZ-01
L2 10UH

C11 22UF,50V SANYO 50CE22BS

C10 10UF,35V 1206

C9 0.01UF 0603

VISHAY
IHLP-2525CZ-01
L1 6.8UH

C1 0.47UF

D1 MBRA340T3

C3 10UF,35V 1206

U1 LT1913EDD

BD BOOST
SW
VIN
RUN/SS

RT
VC
FB
PGOOD
SYNC
GND

R1 45.3K

C8 100PF

R5 15K
C6 1000PF

R2 110K
R3 590K
R4 100K

VOUT

C4 47UF,10V 1206

C5 0.1UF 50V 0603

E5 VOUT 5V@3.5A
E6 GND
E7 PGOOD
E8 GND
E9 SYNC

VIN
E1 VIN 6.5V - 25V

C2 22UF,63V SANYO 63CE22BS

E2 GND
E3 GND

JP1
1
2
3
4
RUN
SHDN
EXTSS

R6 100K

C7 0.22UF,50V 0805

E4 EXTSS

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0402.
   ALL CAPACITORS ARE IN MICROFARADS, 0402.

2. INSTALL SHUNT ON JP1 PINS 1&2.

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 TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

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CHECKED:
APPROVED:
ENGINEER: KEVIN H.
DESIGNER:

TITLE: SCHEMATIC
3.5A, 25V STEP-DOWN SWITCHING REGULATOR WITH SYNC FUNCTION

DWG NO. DC1316A - LT1913EDD
SIZE A
DATE: Monday, December 10, 2007

REV A
SHEET 1 OF 1

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