DEMO CIRCUIT 825
QUICK START GUIDE

LT1936
500kHz Step-Down Switching Regulator

DESCRIPTION

Demonstration circuit 825 is a monolithic step-down DC/DC switching regulator featuring the LT1936. The demo board is optimized for 3.3V output at 1.2A from a 4.5V to 36V input or a 5V, 1.2A output from a 6.8V to 36V input. The output is selectable by placing the JP1 jumper at the 3.3V or 5V position.

The wide input range of the LT1936 allows a variety of input sources. The typical sources are automotive batteries, wall adaptors, 5V logic supplies and industrial supplies. The 500kHz switching frequency allows small, low cost inductor and ceramic capacitors, resulting in low, predictable output ripple. The current-mode control topology creates fast transient response and great loop stability. A VC pin is available for customizing external compensation. If smaller size is critical, internal compensation can be used. Higher efficiency is achieved by using a low resistance internal power switch. The gate drive of the switch is boosted to a voltage that is higher than the Vin to ensure saturation of the switch. A charge pump consisting of D2 and C8 on the demo board performs the boost function. The SHDN pin can be used to set the part in micropower shutdown mode, reducing the supply current to less than 2uA. The SHDN pin can also be used to program soft start. In this mode, the SHDN pin is driven through an external RC filter (R6 and C9) to create a voltage ramp at this pin. The soft start function reduces input current surge during start-up. The optional capacitor C6 is to damp overshoot voltage that otherwise might damage the IC when the circuit is plugged into a live supply through long wires. Cycle-by-cycle current limit, frequency foldback and thermal shutdown provide protection against shorted outputs.

The LT1936 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 825.

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

PERFORMANCE SUMMARY

Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Iq	Quiescent Current	Iout=0A		1.8	2.5	mA
Iqs	Quiescent Current in Shutdown	JP2 on OFF position		0.1	2	uA
VIN	Input Voltage to Run	Vout = 3.3V	4.5		36	V
Vin	Input Voltage to Run	Vout = 5V	6.8		36	V
VOUT	Output Voltage	JP1 on 3.3V Position	3.168	3.3	3.432	V
Vout	Output Voltage	JP1 on 5V Position	4.8	5	5.2	V
Iout	Output Current				1.2	A
EFf	Efficiency	Vin=12V, Vout=3.3V, Iout=1.2A		83		%
EFf	Efficiency	Vin=12V, Vout=5V, Iout=1.2A		87		%
Vpp	Output Voltage Ripple	Vin=12V, Vout=5V, Iout=1.2A		15		mV
Vpp	Output Voltage Ripple	Vin=12V, Vout=3.3V, Iout=1.2A		13		mV

QUICK START PROCEDURE

Demonstration circuit 825 is easy to set up to evaluate the performance of the LT1936. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

Note 1. For robust operation in fault conditions (start-up or short circuit) and high input voltage (>30V), an inductor with saturation current above 2.6A should be used.

Note 2. 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 jumpers in the following positions:

   JP1 3.3V or 5V
   JP2 ON

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

3. Turn on the power at the input.

   Note 3. Make sure that the input voltage does not exceed 36V. During hot-plug, the transient voltage at the VIN pin can exceed this limit even when the source voltage is well below it. See application note 88 for more details.

4. Check for the proper output voltages.

   Note 4. If there is no output, temporarily disconnect the load to make sure that the load is not set too high. Also refer to the Typical Minimum Input Voltage vs. Load Current in the Typical Performance Characteristics section of the datasheet.

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

6. To evaluate soft start, replace R6 on the demo board with a 15KΩ resistor and measure the inductor current.

7. To use internal compensation, remove R3, C3 and C4, and populate R5.

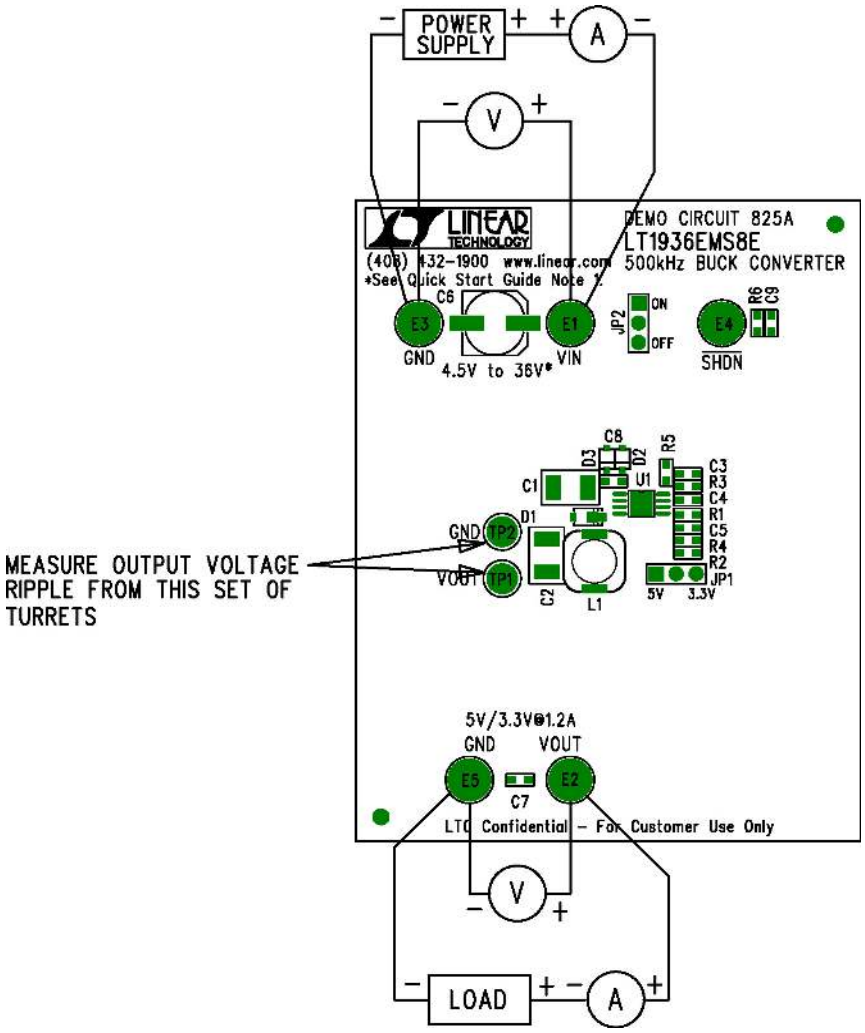


Figure 1. Proper Measurement Equipment Setup

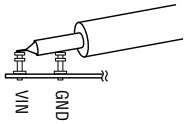
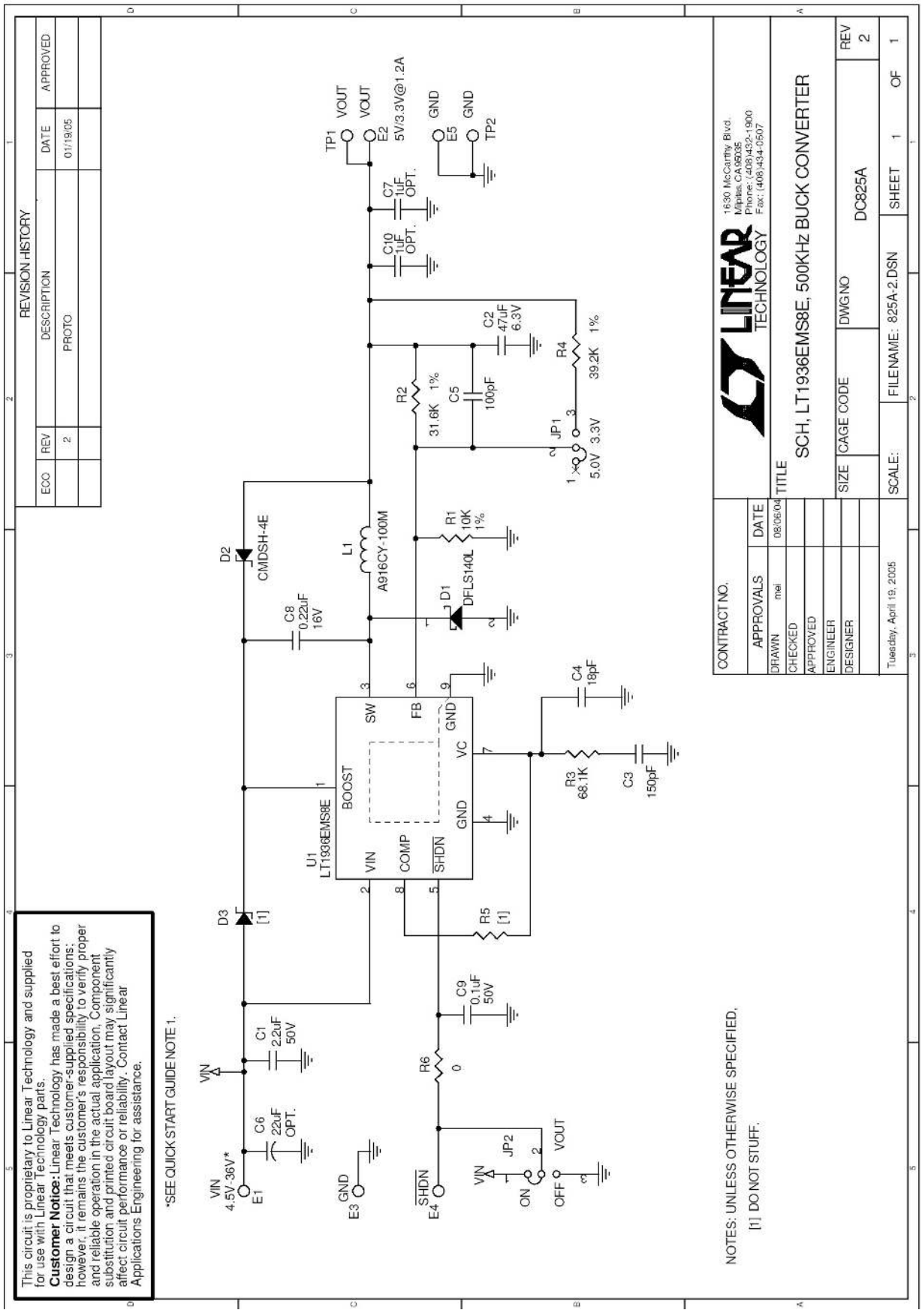


Figure 2. Measuring Input or Output Ripple


REVISION HISTORY
ECO
REV
DESCRIPTION
DATE
APPROVED
2
PROTO
01/19/05
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 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 Applications Engineering for assistance.
*SEE QUICK START GUIDE NOTE 1.
NOTES: UNLESS OTHERWISE SPECIFIED,
[1] DO NOT STUFF.
U1
LT1936EMS8E
BOOST
SW
FB
GND
VC
VIN
COMP
SHDN
GND
D1
DFLS140L
D2
CMDSH-4E
D3
[1]
L1
A916CY-100M
R1
10K
1%
R2
31.6K
1%
R3
68.1K
R4
39.2K
1%
R5
[1]
R6
0
C1
2.2uF
50V
C2
47uF
6.3V
C3
150pF
C4
18pF
C5
100pF
C6
22uF
OPT.
C7
1uF
OPT.
C8
0.22uF
16V
C9
0.1uF
50V
C10
1uF
OPT.
JP1
5.0V
3.3V
JP2
ON
OFF
VIN
4.5V-36V*
E1
GND
E3
SHDN
E4
VOUT
E2
5V/3.3V@1.2A
TP1
VOUT
GND
E5
TP2
CONTRACT NO.
APPROVALS
DATE
DRAWN
mel
08/06/04
CHECKED
APPROVED
ENGINEER
DESIGNER
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
TITLE
SCH, LT1936EMS8E, 500KHz BUCK CONVERTER
SIZE
CAGE CODE
DWG NO
DC825A
REV
2
SCALE:
FILENAME: 825A-2.DSN
SHEET 1 OF 1
Tuesday, April 19, 2005