

## DESCRIPTION

Demonstration circuit 662 is a monolithic step-down DC/DC switching converter featuring the LT<sup>®</sup>1933. The board is optimized for 3.3V output at up to 500mA load current for a steady state input voltage range of 4.5V to 36V. With its wide input voltage range, high current internal power switch, low drop-out operation, 500kHz switching frequency and tiny SOT-23 package, the LT1933 is a very versatile and powerful IC for DC/DC converters that require extremely compact space, high efficiency and high input voltage.

The LT1933 500kHz switching frequency allows all of the components to be small, surface mount devices. The current-mode control topology creates fast transient response and good loop stability with a minimum number of external components. The low resistance internal power switch ( $0.37V V_{CEsat}$ ) achieves high efficiencies of up to 84%. The shutdown pin can be used to program undervoltage lockout or place the part in micropower shutdown, reducing supply current to less than 2 $\mu$ A by driving the pin low (*without*

*R1 installed*). The internal soft start function reduces input current surge during start-up.

The LT1933 datasheet gives a complete description of the part, operation and applications information. The datasheet must be read in conjunction with this Quick Start Guide for demonstration circuit 662. In particular, the datasheet section on 'Thermal Calculations' is important for estimating whether a given application's combination of input voltage, load current, ambient temperature and frequency will cause the LT1933 to exceed its absolute maximum rated junction temperature. The LT1933 is assembled in a small low profile SOT-23 ThinSOT package. Proper board layout is essential for maximum thermal performance. See the datasheet section 'Layout Considerations'.

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

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## QUICK START PROCEDURE

Demonstration circuit 662 is easy to set up to evaluate the performance of the LT1933. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

**NOTE:** Make sure that the input voltage does not exceed 36V.

**NOTE:** The shutdown function is optional and its terminal can be left floating (disconnected) if shutdown is not being used.

**NOTE:** Do not hot-plug the input voltage terminal VIN. The absolute maximum voltage on VIN is 36V and hot-plugging a power supply through wire leads to the demonstration circuit can cause the voltage on the extremely low-ESR ceramic input capacitor to ring to twice its DC value. In order to protect the IC, a

higher ESR Aluminum Electrolytic capacitor, C4, is placed at the input terminals. This may protect against some, but not all, input transients due to hot-plugging with a power supply. *See Application Note 88 for more details.*

**NOTE:** Connect the power supply (with power off), load, and meters as shown in Figure 1.

1. After all connections are made, turn on input power and verify that the output voltage is 3.3V.

**NOTE:** If the output voltage is too low, temporarily disconnect the load to make sure that the load is not set too high.

2. Once the proper output voltages are established, adjust the load within the operating range and ob-

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 662

## 36V 600mA 500KHz SOT-23 STEP-DOWN REGULATOR

serve the output voltage regulation, ripple voltage, efficiency and other parameters.

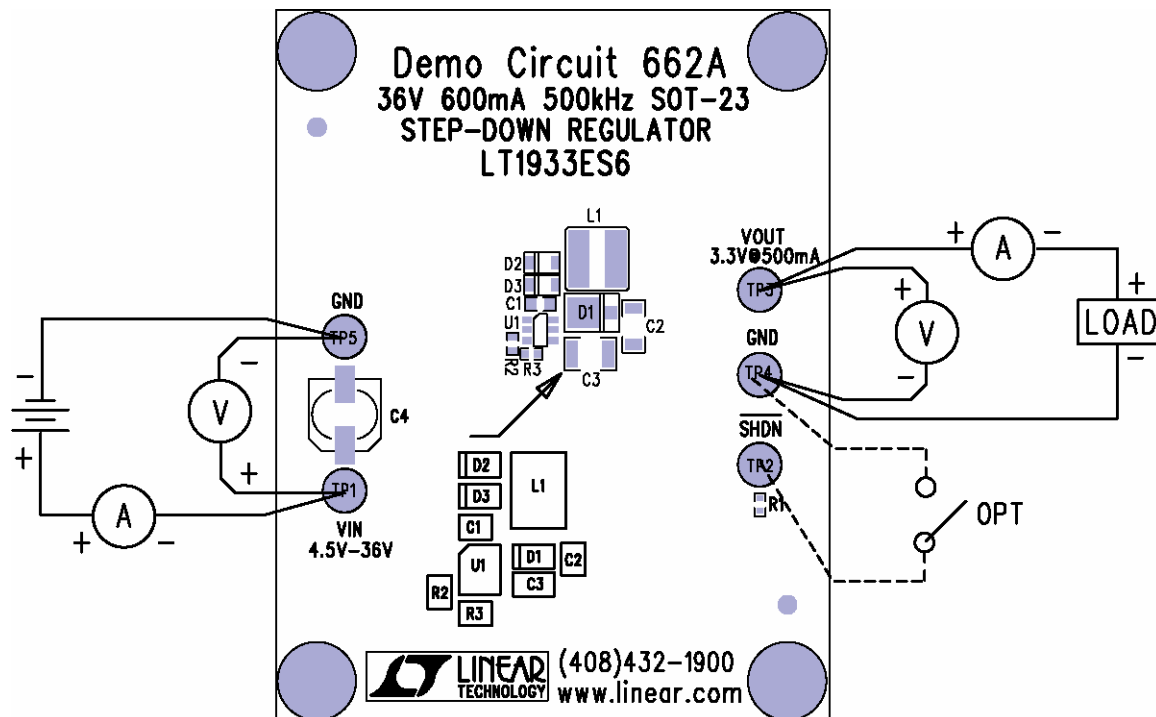
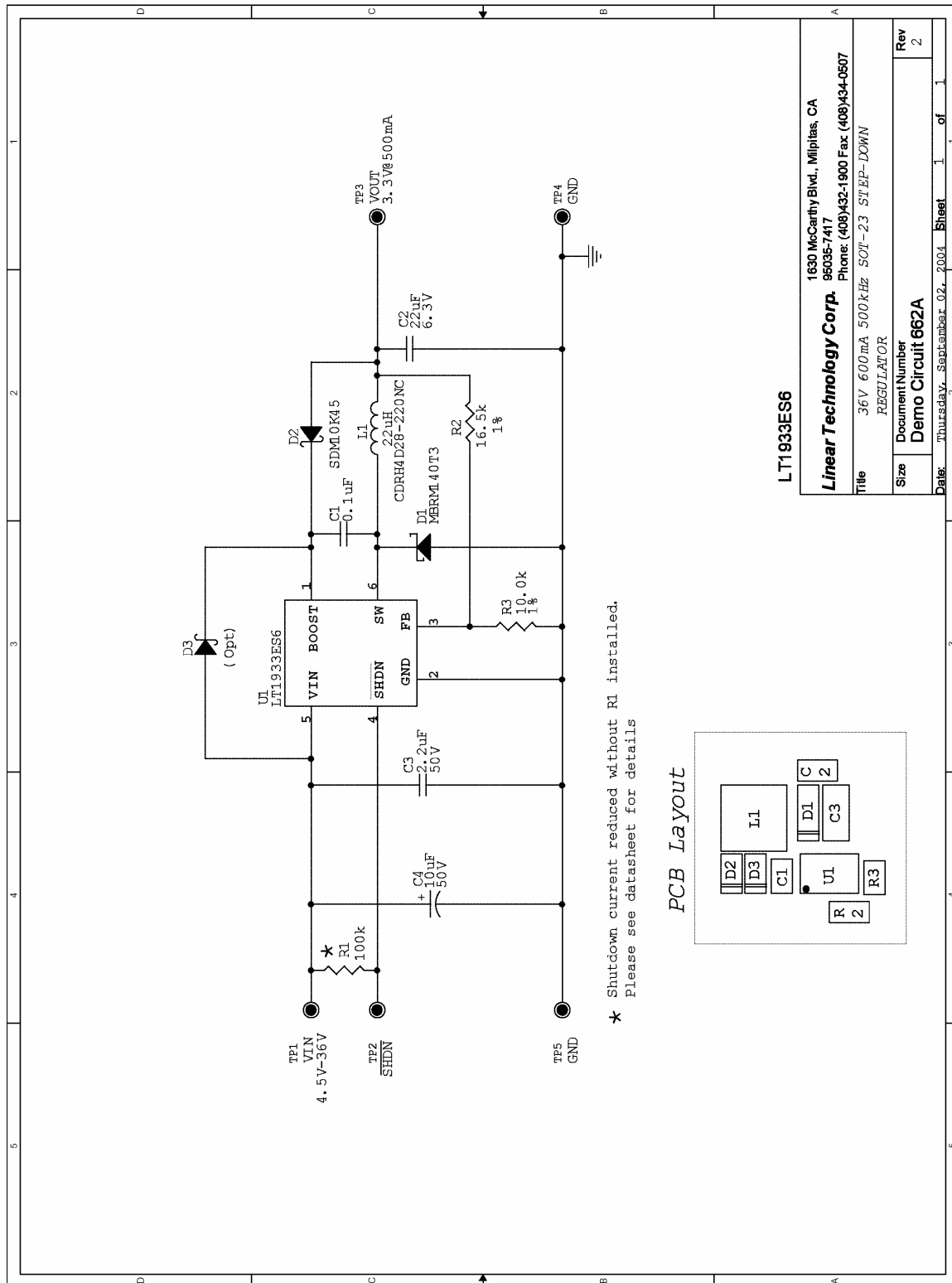
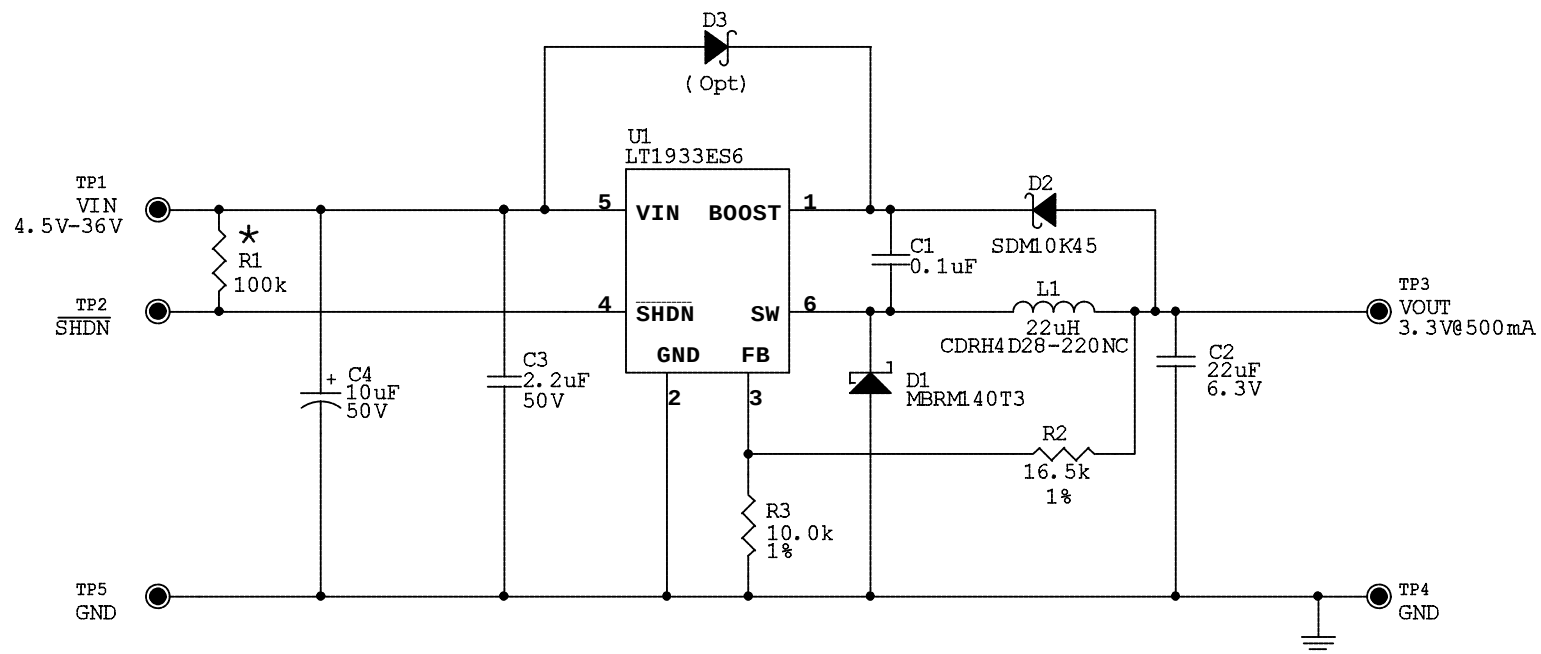


Figure 1. Proper Measurement Equipment Setup

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 662

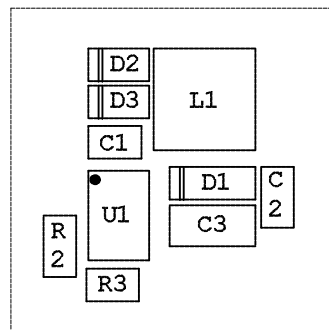
## 36V 600mA 500KHz SOT-23 STEP-DOWN REGULATOR





★ Shutdown current reduced without R1 installed.  
Please see datasheet for details

### PCB Layout



### LT1933ES6

|                                                                                                                              |                                      |              |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------|
| <b>Linear Technology Corp.</b><br>1630 McCarthy Blvd., Milpitas, CA<br>95035-7417<br>Phone: (408)432-1900 Fax: (408)434-0507 |                                      |              |
| Title 36V 600mA 500kHz SOT-23 STEP-DOWN<br>REGULATOR                                                                         |                                      |              |
| Size                                                                                                                         | Document Number<br>Demo Circuit 662A | Rev<br>2     |
| Date:                                                                                                                        | Thursday, September 02, 2004         | Sheet 1 of 1 |

| <b>Item</b> | <b>Qty</b> | <b>Reference</b>    | <b>Part Description</b>       | <b>Manufacture / Part #</b>  |
|-------------|------------|---------------------|-------------------------------|------------------------------|
|             |            |                     |                               |                              |
| 1           | 1          | C1                  | Cap., X7R 0.1uF 16V 10%       | AVX 0603YC104KAT1A           |
| 2           | 1          | C2                  | Cap., X5R 22uF 6.3V 10%       | Taiyo Yuden JMK316BJ226KL-T  |
| 3           | 1          | C3                  | Cap., X7R 2.2uF 50V 10%       | TDK C3225X7R1H225KT          |
| 4           | 1          | C4                  | Cap., Alum 10uF 50V 20%       | OSCON 50CV10BJ               |
| 5           | 1          | D1                  | Schottky Rectifier, Powermite | ON Semiconductor MBRM140T3   |
| 6           | 1          | D2                  | Schottky Diode, 1A/45V        | Diodes Inc. SDM10K45-7       |
| 7           | 0          | D3                  | (OPT)                         | (OPT)                        |
| 8           | 1          | L1                  | Inductor, 22uH                | Sumida CDRH4D28-220NC        |
| 9           | 1          | R1                  | Res., Chip 100K 0.06W 5%      | AAC CR05-104JM               |
| 10          | 1          | R2                  | Res., Chip 16.5K 0.06W 1%     | AAC CR05-1652FM              |
| 11          | 1          | R3                  | Res., Chip 10.0K 0.06W 1%     | AAC CR05-1002FM              |
| 12          | 5          | TP1,TP2,TP3,TP4,TP5 | Turret, Testpoint             | Mill Max 2501-2              |
| 13          | 1          | U1                  | I.C., Switching Reg.          | Linear Tech. Corp. LT1933ES6 |
| 14          | 4          |                     | SCREW #4-40 1/4"              | ANY                          |
| 15          | 4          |                     | STANDOFF #4-40x1/4"           | MICRO PLASTICS 14HTSP101     |
| 16          | 1          |                     | PRINTED CIRCUIT BOARD         | DEMO CIRCUIT #662A           |
| 17          | 1          |                     | STENCIL (TOP)                 | STENCIL #662A                |

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