

## 42V, 750mA Step-Down Regulator with 2.5 $\mu$ A Quiescent Current

### DESCRIPTION

Demonstration circuit 1730A features the LT3973, a monolithic step-down switching regulator which consumes only 2.5 $\mu$ A quiescent current. The demo circuit is designed for a 5V, 750mA output from a 5.6V to 42V input. The wide input range of the LT3973 allows a variety of input sources including automotive batteries and 24V industrial supplies. In order to reduce the number of components and solution size, the catch diode and boost diode are integrated. The switching frequency is adjustable up to 2.2MHz. At light loads, the regulator operates in Burst Mode® to maintain high efficiency and low output ripple.

The current mode control scheme creates fast transient response and good loop stability. During short circuit and

overvoltage conditions, the catch diode current is limited to protect the part. Users can populate R7 and R8 on the EN/UVLO pin to provide a programmable undervoltage lockout. In addition, the shutdown feature can be utilized by placing jumper JP1 in the OFF position.

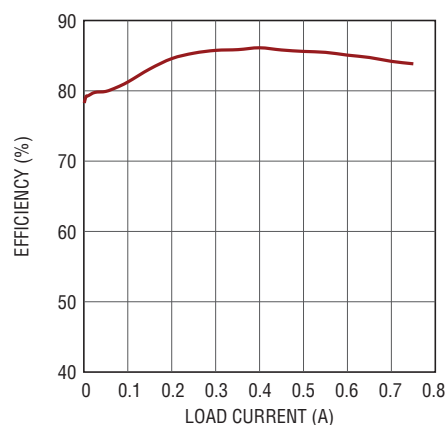
The LT3973 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for working on or modifying the demo circuit 1730A.

**Design files for this circuit board are available at <http://www.linear.com/demo>**

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### PERFORMANCE SUMMARY (T<sub>A</sub> = 25°C)

| PARAMETER                   | CONDITIONS                                      | VALUE          |
|-----------------------------|-------------------------------------------------|----------------|
| Minimum Input Voltage       |                                                 | 5.6V           |
| Maximum Input Voltage       |                                                 | 42V            |
| Output Voltage              |                                                 | 5.04V $\pm$ 3% |
| Maximum Output Current      |                                                 | 750mA          |
| Typical Switching Frequency |                                                 | 600kHz         |
| Typical Efficiency          | V <sub>IN</sub> = 12V, I <sub>OUT</sub> = 750mA | 84%            |



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Figure 1. DC1730A Efficiency: V<sub>IN</sub> = 12V, V<sub>OUT</sub> = 5V, 600kHz

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## QUICK START PROCEDURE

Demonstration circuit 1730A is easy to set up to evaluate the performance of the LT3973. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

1. Place Jumper JP1 in the ON position.
2. With power off, connect the input power supply to VIN and GND.
3. With power off, connect load from VOUT to GND.
4. Turn on the power at the input.

**NOTE.** Make sure that the input voltage does not exceed 42V.

5. 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 or is shorted.

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

## QUICK START PROCEDURE

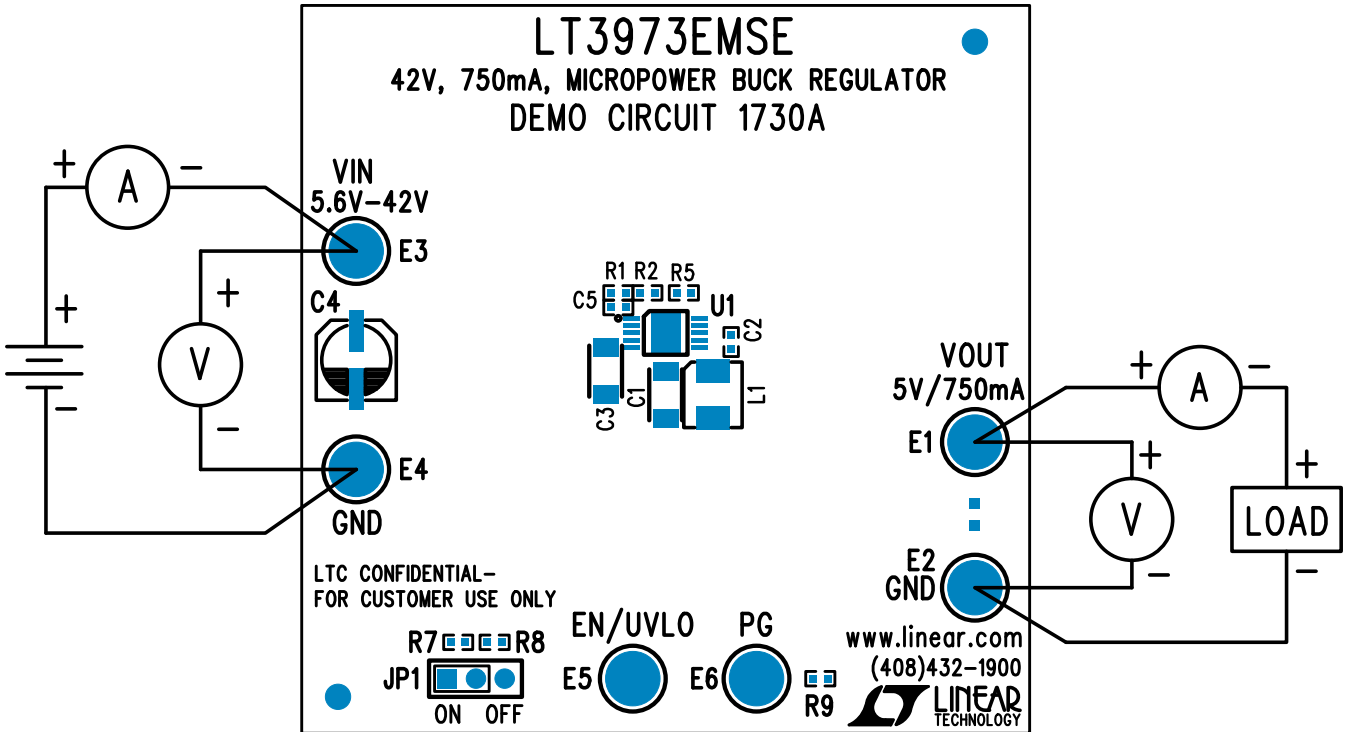


Figure 2. DC1730A Proper Measurement Equipment Setup

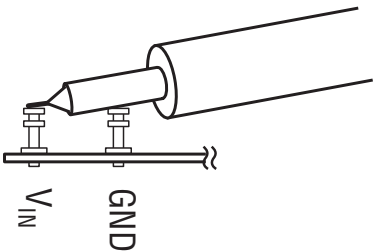


Figure 3. Measuring Input or Output Ripple

# DEMO MANUAL DC1730A

## PARTS LIST

| ITEM                                            | QTY | REFERENCE | PART DESCRIPTION                   | MANUFACTURER/PART NUMBER            |
|-------------------------------------------------|-----|-----------|------------------------------------|-------------------------------------|
| <b>REQUIRED CIRCUIT COMPONENTS</b>              |     |           |                                    |                                     |
| 1                                               | 1   | C1        | CAP, X5R 22 $\mu$ F 6.3V 20% 1206  | TAIYO YUDEN JMK316BJ226ML-T         |
| 2                                               | 1   | C2        | CAP, X5R 0.22 $\mu$ F 10V 20% 0402 | AVX, 0402ZD224MAT2A                 |
| 3                                               | 1   | C3        | CAP, X7R 2.2 $\mu$ F 50V 10% 1206  | MURATA, GRM31CR71H225KA88L          |
| 4                                               | 1   | C5        | CAP, NPO, 10pF, 25V, 10%, 0402     | AVX, 04023A100KAT2A                 |
| 5                                               | 1   | L1        | IND, 15 $\mu$ H                    | COOPER/COILTRONICS, MPI4040R3-150-R |
| 6                                               | 1   | R1        | RES., CHIP, 1.00M, 1/16W, 1%, 0402 | NIC, NRC04F1004TRF                  |
| 7                                               | 1   | R2        | RES., CHIP, 316k, 1/16W, 1%, 0402  | NIC, NRC04F3163TRF                  |
| 8                                               | 1   | R5        | RES., CHIP, 215k, 1/16W, 1%, 0402  | NIC, NRC04F2153TRF                  |
| 9                                               | 1   | R9        | RES., CHIP, 200k, 1/16W, 5%, 0402  | NIC, NRC04J204TRF                   |
| 10                                              | 1   | U1        | I.C., Buck Reg. MSE10              | LINEAR TECH., LT3973EMSE            |
| <b>ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS</b> |     |           |                                    |                                     |
| 1                                               | 1   | C4        | CAP, ALUMINUM EL. 10 $\mu$ F, 50V  | SUN ELECT, 50CE10BSS                |
| 2                                               | 0   | R7-R8     | RES., 0402                         |                                     |
| <b>HARDWARE FOR DEMO BOARD ONLY</b>             |     |           |                                    |                                     |
| 1                                               | 6   | E1-E6     | TURRET, 0.094"                     | MILL-MAX, 2501-2-00-80-00-00-07-0   |
| 2                                               | 1   | JP1       | JMP, 1X3-079                       | WÜRTH, 62000311121                  |
| 3                                               | 1   | SHUNT     | SHUNT, 2mm Ctrs.                   | WÜRTH, 60800213421                  |



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