

## DESCRIPTION

Demonstration Circuit 697 is a quad output power supply intended for use in large TFT-LCD panels. The circuit features the LT1943 high current quad-output switching regulator and generates a 3.3V logic supply along with the triple output supply required for the TFT-LCD panels. With an input voltage range of 4.5V to 8V, a step down regulator provides 3.3V  $V_{\text{LOGIC}}$  with up to 1.5A current; a high power boost converter, a lower power boost converter and an inverting converter provide three independent output voltages  $AV_{\text{DD}}$ ,  $V_{\text{ON}}$  and  $V_{\text{OFF}}$  required by the LCD panels. An internal high side PNP provides delayed turn on of the  $V_{\text{ON}}$  signal.

All four switchers are synchronized to the internal 1.2MHz clock, allowing the use of low profile inductors and ceramic capacitors. They all have soft-start to limit inrush current.

Long wires run from input sources (such as wall adaptors) can cause large voltage spikes during initial plug-in. C17 is installed on DC697 to damp the possible voltage spikes. C17 is not required for applications where input source is close to the regulator. Please refer to Application Note 88 for details.

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

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**Table 1. Performance Summary ( $T_A = 25^\circ\text{C}$  unless otherwise noted)**

| PARAMETER                                    | CONDITION                                                                                    | VALUE                 |
|----------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------|
| Minimum Input Voltage                        | $-40^\circ\text{C}$ to $85^\circ\text{C}$                                                    | 4.5V                  |
| Maximum Input Voltage                        | $-40^\circ\text{C}$ to $85^\circ\text{C}$                                                    | 8V                    |
| Output Voltage $V_{\text{LOGIC}}$            | $V_{\text{IN}} = 4.5\text{V}$ to $8\text{V}$ , $I_{\text{OUT}} = 0\text{A}$ to $1.5\text{A}$ | $3.3\text{V} \pm 3\%$ |
| Maximum Output Current at $V_{\text{LOGIC}}$ | $V_{\text{IN}} = 4.5\text{V}$ to $8\text{V}$                                                 | 1.5A                  |
| Typical Output Ripple $V_{\text{LOGIC}}$     | $V_{\text{IN}} = 5\text{V}$ , load at $V_{\text{LOGIC}} = 1.5\text{A}$ (20MHz BW)            | 19mV <sub>P-P</sub>   |
| Typical Output Ripple $AV_{\text{DD}}$       | $V_{\text{IN}} = 5\text{V}$ , load at $AV_{\text{DD}} = 500\text{mA}$ (20MHz BW)             | 33mV <sub>P-P</sub>   |
| Typical Switching Frequency                  |                                                                                              | 1.2MHz                |
| On/Off Control                               | Logic Low Voltage-Off, $-40^\circ\text{C}$ to $85^\circ\text{C}$                             | 0.4V MAX              |
|                                              | Logic High Voltage-On                                                                        | 2.4V MIN              |

## QUICK START PROCEDURE

Demonstration circuit 697 is easy to set up to evaluate the performance of the LT1943. 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 input or one of the outputs and GND terminals.

See Figure 2 for proper scope probe technique.

1. With power off, connect the input power supply to  $V_{\text{IN}}$  and GND.
2. Set the input between 4.5V to 8V. Turn on the power at the input.

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 697

## HIGH CURRENT QUAD OUTPUT SWITCHING REGULATOR FOR 5V INPUT TFT-LCD PANELS

3. Check for the proper output voltages. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
4. Once the proper output voltages are established, adjust the loads within the operating range and ob-

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

**NOTE:** If more than 20mA is needed at  $V_{ON}$ , connect L3 to a higher input, such as  $AV_{DD}$ .

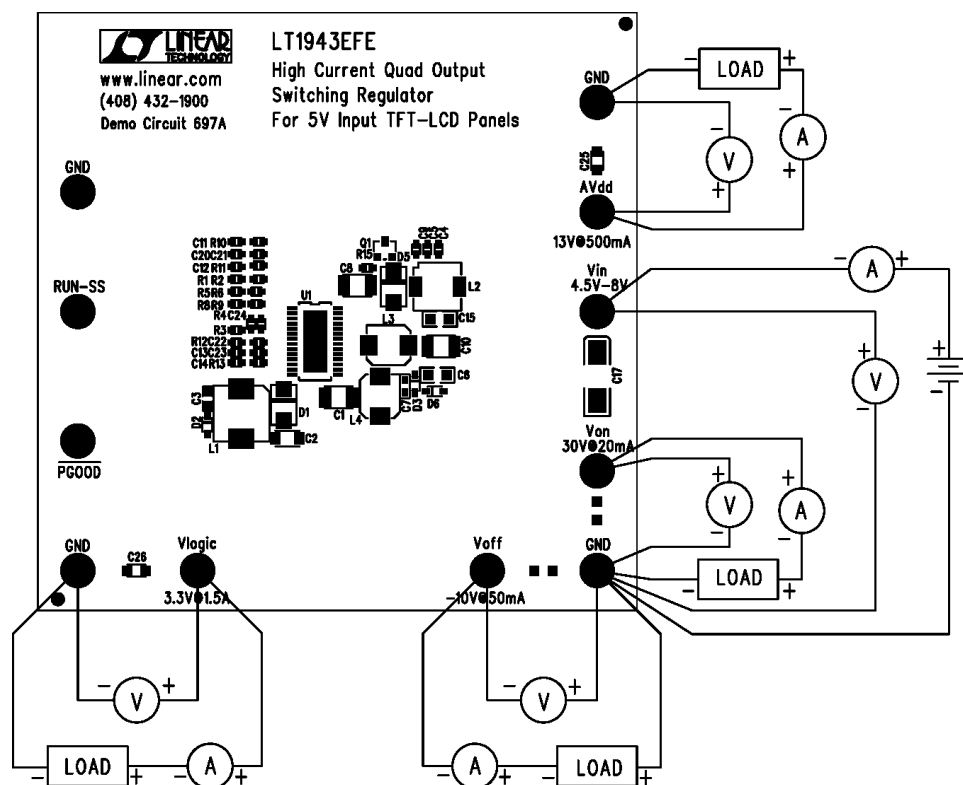


Figure 1. Proper Measurement Equipment Setup

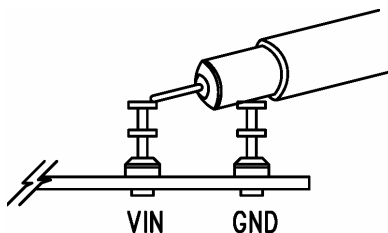


Figure 2. Measuring Input or Output Ripple



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| Item | Qty | Reference   | Part Description                        | Manufacture / Part #       |
|------|-----|-------------|-----------------------------------------|----------------------------|
|      |     |             |                                         |                            |
|      |     |             |                                         |                            |
|      |     |             |                                         |                            |
| 1    | 1   | C1          | CAP., X7R, 10uF, 10V, 20% 1210          | Taiyo Yuden, LMK325BJ106MN |
| 2    | 1   | C8          | CAP., X5R, 10uF, 16V, 20% 1210          | Taiyo Yuden, EMK325BJ106MN |
| 3    | 1   | C2          | CAP., X5R, 22uF, 6.3V, 20% 1206         | Taiyo Yuden, JMK316BJ226ML |
| 4    | 1   | C3          | CAP., X7R, 0.22uF, 10V, 20% 0603        | AVX, 0603ZC224MAT2A        |
| 5    | 2   | C5,C4       | CAP., X7R, 0.015uF, 16V, 20% 0402       | AVX, 0402YC153MAT2A        |
| 6    | 1   | C6          | CAP., X7R, 2.2uF, 10V, 10% 0805         | MuRata, GRM21BR71A225KA01L |
| 7    | 1   | C7          | CAP., X5R, 0.47uF, 16V, 20% 0603        | AVX, 0603YD474MAT2A        |
| 8    | 1   | C9          | CAP., X5R, 0.047uF, 16V, 10% 0402       | AVX, 0402YD473KAT2A        |
| 9    | 1   | C10         | CAP., X5R, 2.2uF, 35V, 20% 1210         | Taiyo Yuden, GMK325BJ225MN |
| 10   | 1   | C11         | CAP., X7R, 2700pF, 50V, 20%, 0402       | AVX, 04025C272MAT2A        |
| 11   | 1   | C14         | CAP., X7R, 2200pF, 50V, 20% 0402        | AVX, 04025C222MAT2A        |
| 12   | 1   | C12         | CAP., X7R, 4700pF, 50V, 20% 0402        | AVX, 04025C472MAT2A        |
| 13   | 1   | C13         | CAP., X7R, 1500pF, 50V, 20% 0402        | AVX, 04025C152MAT2A        |
| 14   | 1   | C15         | CAP., X5R, 0.47uF, 35V, 20% 0805        | Taiyo Yuden, GMK212BJ474MG |
| 15   | 1   | C17         | CAP., TANT, 68uF, 16V, 20% 6032         | AVX, TAJC686M016R          |
| 16   | 4   | C20-C23     | CAP., X7R, 100pF, 50V, 20% 0402         | AVX, 04025C101MAT2A        |
| 17   | 1   | C24         | CAP., NPO, 10pF, 50V, 10% 0402          | AVX, 04025A100KAT2A        |
| 18   | 1   | C25         | CAP., X5R, 1.0uF 16V, 20% 0805          | TAIYO YUDEN, EMK212BJ105MG |
| 19   | 1   | C26         | CAP., X7R, 1.0uF 10V, 20% 0805          | TAIYO YUDEN, LMK212BJ105MG |
| 20   | 1   | D1          | Schottky Barrier REC., B230A SMA        | Diodes Inc., B230A-13      |
| 21   | 1   | D2          | Schottky Diode, CMDSH-3 SOD-323         | CENTRAL SEMI., CMDSH-3-LTC |
| 22   | 2   | D3,D6       | Schottky Barries Dio., ZHCS400, SOD-323 | ZETEX, ZHCS400TA           |
| 23   | 1   | D5          | Schottky Barrier REC., B240A SMA        | Diodes Inc., B240A-13      |
| 24   | 1   | Q1          | P-Mosfet, Si2343DS, SOT-23              | VISHAY, Si2343DS           |
| 25   | 11  | E1-E11      | TURRET,                                 | MILL-MAX, 2501-2           |
| 26   | 1   | L1          | INDUCTOR, 4.7uH RLF7030                 | TDK, RLF7030T-4R7M3R4      |
| 27   | 1   | L2          | INDUCTOR, 4.7uH SLF6028                 | TDK, SLF6028T-4R7M1R6      |
| 28   | 1   | L4          | INDUCTOR, 10uH RLF5018                  | TDK, RLF5018T-100MR94      |
| 29   | 1   | L3          | INDUCTOR, 6.8uH RLF5018                 | TDK, RLF5018T-6R8M1R1      |
| 30   | 1   | R10         | RES., CHIP, 7.5K, 1/16W, 5% 0402        | AAC, CR05-752JM            |
| 31   | 1   | R11         | RES., CHIP, 4.7K, 1/16W, 5% 0402        | AAC, CR05-472JM            |
| 32   | 4   | R1,R5,R8,R4 | RES., CHIP, 10K, 1/16W, 1% 0402         | AAC, CR05-1002FM           |
| 33   | 1   | R12         | RES., CHIP, 30K, 1/16W, 5% 0402         | AAC, CR05-303JM            |
| 34   | 1   | R13         | RES., CHIP, 13K, 1/16W, 5% 0402         | AAC, CR05-133JM            |

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| <i>Item</i> | <i>Qty</i> | <i>Reference</i> | <i>Part Description</i>           | <i>Manufacture / Part #</i> |
|-------------|------------|------------------|-----------------------------------|-----------------------------|
|             |            |                  |                                   |                             |
|             |            |                  |                                   |                             |
|             |            |                  |                                   |                             |
| 35          | 1          | R2               | RES., CHIP, 16.5K, 1/16W, 1% 0402 | AAC, CR05-1652FM            |
| 36          | 1          | R3               | RES., CHIP, 80.6K, 1/16W, 1% 0402 | AAC, CR05-8062FM            |
| 37          | 1          | R6               | RES., CHIP, 95.3K, 1/16W, 1% 0402 | AAC, CR05-9532FM            |
| 38          | 1          | R9               | RES., CHIP, 232K, 1/16W, 1% 0402  | AAC, CR05-2323FM            |
| 39          | 1          | R15              | RES., CHIP, 100K, 1/16W, 5% 0402  | AAC, CR05-104JM             |
| 40          | 1          | U1               | I.C.LT1943EFE, TSSOP28FE          | LINEAR., LT1943EFE          |
| 41          | 1          |                  | PRINTED CIRCUIT BOARD             | FAB., DEMO CIRCUIT 697A     |
| 42          | 1          |                  | STENCIL                           | STENCIL 697A                |