

# LT8582

## Dual 3A Boost/Inverting/SEPIC DC/DC Converter

### DESCRIPTION

Demonstration circuit 1734A features the dual channel LT<sup>®</sup>8582 in boost and inverting regulator configurations. The circuit is designed to convert a 5V to 10V input source to 12V at 900mA and -12V at 590mA as shown in Table 1.

**Table 1. Maximum Guaranteed Output Currents**

| V <sub>IN</sub> (V) | MAX I <sub>LOAD1</sub> (mA) | MAX I <sub>LOAD2</sub> (mA) |
|---------------------|-----------------------------|-----------------------------|
| 4.5                 | 775                         | 540                         |
| 5.0                 | 900                         | 590                         |
| 5.5                 | 1000                        | 625                         |

To limit the temperature rise of the chip to 40°C, on the demo board with no air flow, the maximum combined output power is 15W. Additional input bulk capacitance may be needed, subject to source impedance.

DC1734A is designed to survive output short circuit events. On the positive channel an external disconnect MOSFET protects the boost converter. The negative channel is based on dual inductor inverting topology and does not need the external MOSFET as it is inherently output short protected. The circuit board includes an option to install the external disconnect MOSFET at the input side of the positive channel. To use it, remove Q1 and R1 from the top of the circuit board and install them on the back, in the location of Q2 and R2. Then, place a jumper from Q1's source to drain and cut the top copper as shown in Figure 6.

To change the topology of channel 1 from boost to inverting: Replace D1 with a capacitor similar to C12, replace C2 with a diode similar to D3, placing the diode so that its cathode is connected to ground, and replace R16 with an inductor similar to L3.

To change the topology of channel 2 from inverting to boost: Replace C12 with a diode similar to D1, placing the diode so that its anode is connected to L2, replace D3 with a capacitor similar to C2, and replace L3 with a jumper resistor similar to R16. However, this configuration will not be output short protected since it lacks the external disconnect MOSFET.

Each channel of the LT8582 includes a 42V master and slave power switch combination with 3A total current and can easily be configured as a boost, SEPIC, inverting or flyback converter. The LT8582 has a 2.5V to 22V operating input range, UVLO, soft-start, programmable switching frequency and many other features. The LT8582 data sheet gives a complete description of the part, its 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 1734A.

**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)

| SYMBOL            | PARAMETER                         | CONDITIONS                                             | MIN   | TYP | MAX   | UNITS            |
|-------------------|-----------------------------------|--------------------------------------------------------|-------|-----|-------|------------------|
| V <sub>IN</sub>   | Input Supply Range                |                                                        | 5     |     | 10    | V                |
| V <sub>OUT1</sub> | Channel 1 Output Voltage Accuracy | V <sub>IN</sub> = 5V to 10V, I <sub>LOAD</sub> = 900mA | 11.6  | 12  | 12.4  | V                |
|                   | Channel 1 Output Voltage Ripple   | V <sub>IN</sub> = 5V, I <sub>LOAD</sub> = 900mA        |       | 60  |       | mV <sub>PP</sub> |
|                   | Channel 1 Efficiency              | V <sub>IN</sub> = 5V, I <sub>LOAD</sub> = 900mA        |       | 86  |       | %                |
|                   | Channel 1 Efficiency              | V <sub>IN</sub> = 10V, I <sub>LOAD</sub> = 900mA       |       | 92  |       | %                |
| V <sub>OUT2</sub> | Channel 2 Output Voltage Accuracy | V <sub>IN</sub> = 5V to 10V, I <sub>LOAD</sub> = 590mA | -11.5 | -12 | -12.3 | V                |
|                   | Channel 2 Output Voltage Ripple   | V <sub>IN</sub> = 5V, I <sub>LOAD</sub> = 590mA        |       | 56  |       | mV <sub>PP</sub> |
|                   | Channel 2 Efficiency              | V <sub>IN</sub> = 5V, I <sub>LOAD</sub> = 590mA        |       | 83  |       | %                |
|                   | Channel 2 Efficiency              | V <sub>IN</sub> = 10V, I <sub>LOAD</sub> = 590mA       |       | 85  |       | %                |
| f <sub>S</sub>    | Switching Frequency               |                                                        |       | 1   |       | MHz              |

dc1734af

## QUICK START PROCEDURE

Demonstration circuit DC1734A is easy to set up to evaluate the performance of the LT8582. Refer to Figure 1 for proper measurement equipment set-up and follow the procedure below.

To measure voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Remove the oscilloscope probe end cap and ground lead and set the bandwidth limit on the oscilloscope. Measure the input voltage ripple by touching the probe tip and ground directly across  $V_{IN}$  and GND terminals. See Figure 2 for proper input voltage ripple measurement technique. Measure the positive output voltage ripple by touching the probe tip directly across output capacitor C16 terminals, connecting the probe ground terminal to the board's GND plane. Measure the negative output voltage ripple by touching the probe tip directly across output capacitor C9, connecting the probe ground terminal to the board's GND plane. See Figure 3 for proper output voltage ripple measurement technique.

1. Place the on board jumpers in the following positions:

To activate boost converter: **JP1 ON**

To activate inverting converter: **JP2 ON**

2. With power off, connect the input power supply to  $V_{IN}$  and GND. Apply 7.5V to the input (source must have greater than 10A capability).

3. Check for the proper output voltages.

**NOTE.** 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 voltage is established, adjust the load and the input voltage within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters. The efficiency graphs of the two channels are provided in Figure 4 and Figure 5.

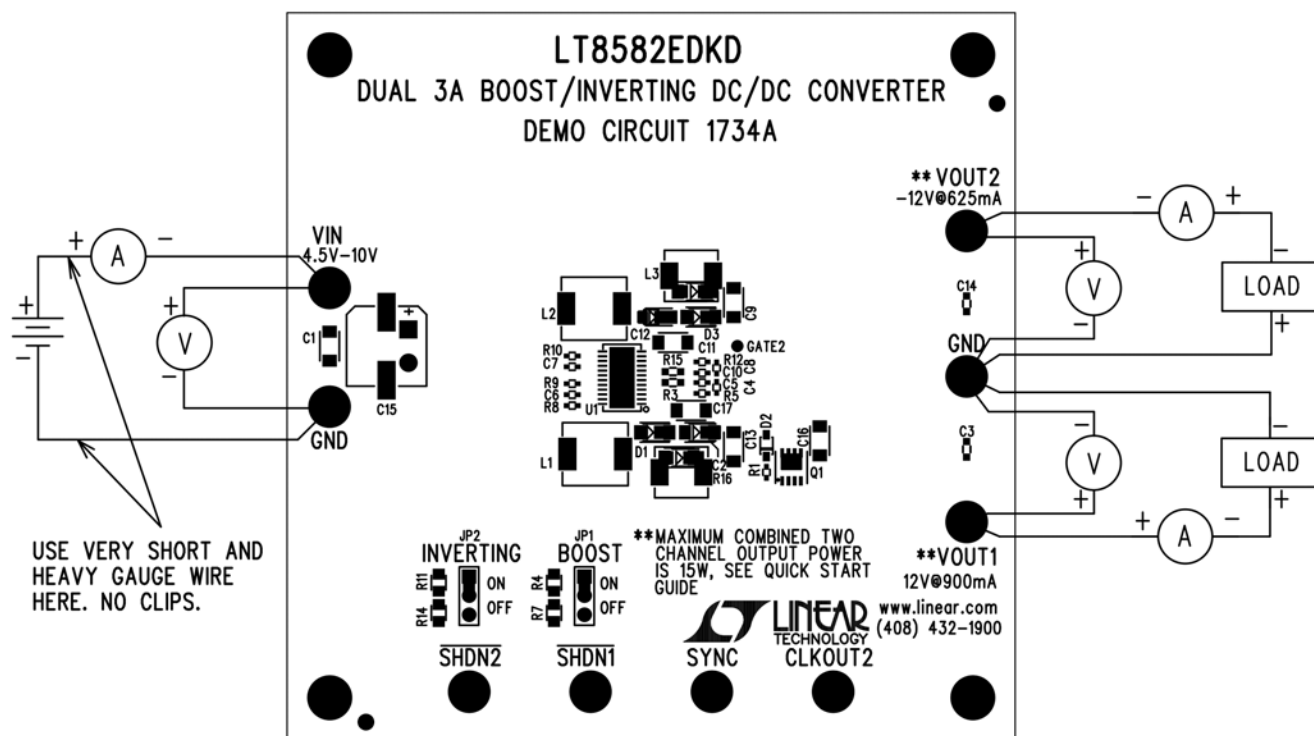


Figure 1. Proper Measurement Equipment Setup

## QUICK START PROCEDURE

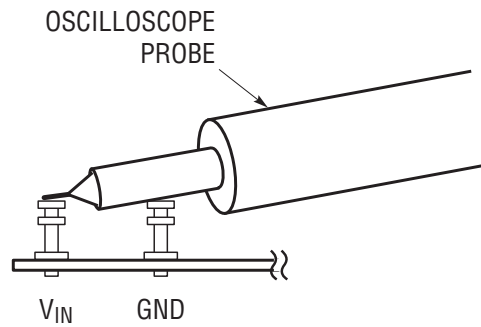


Figure 2. Proper Input Voltage Ripple Measurement Technique

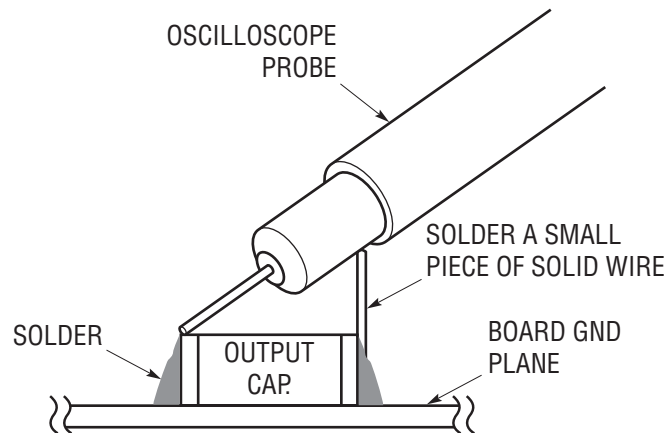


Figure 3. Proper Output Voltage Ripple Measurement Technique

QUICK START PROCEDURE

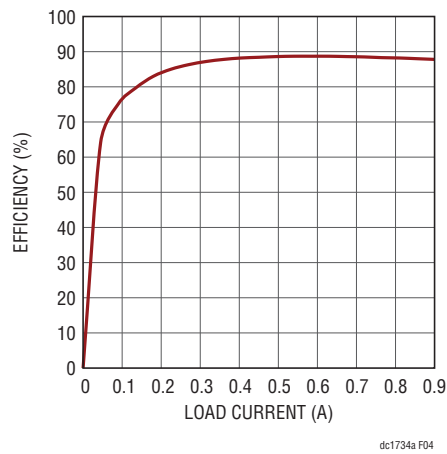


Figure 4. Channel 1 Boost Regulator Efficiency at  $V_{IN} = 5V$

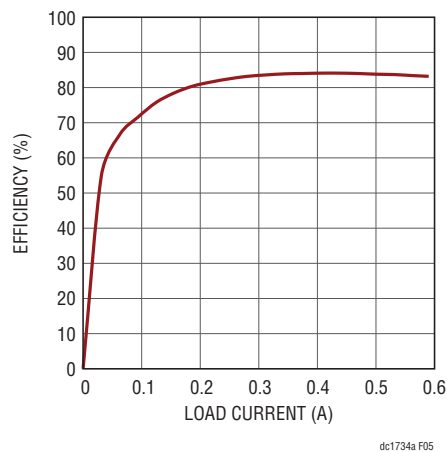


Figure 5. Channel 2 Inverting Regulator Efficiency at  $V_{IN} = 5V$

## BOARD MODIFICATIONS

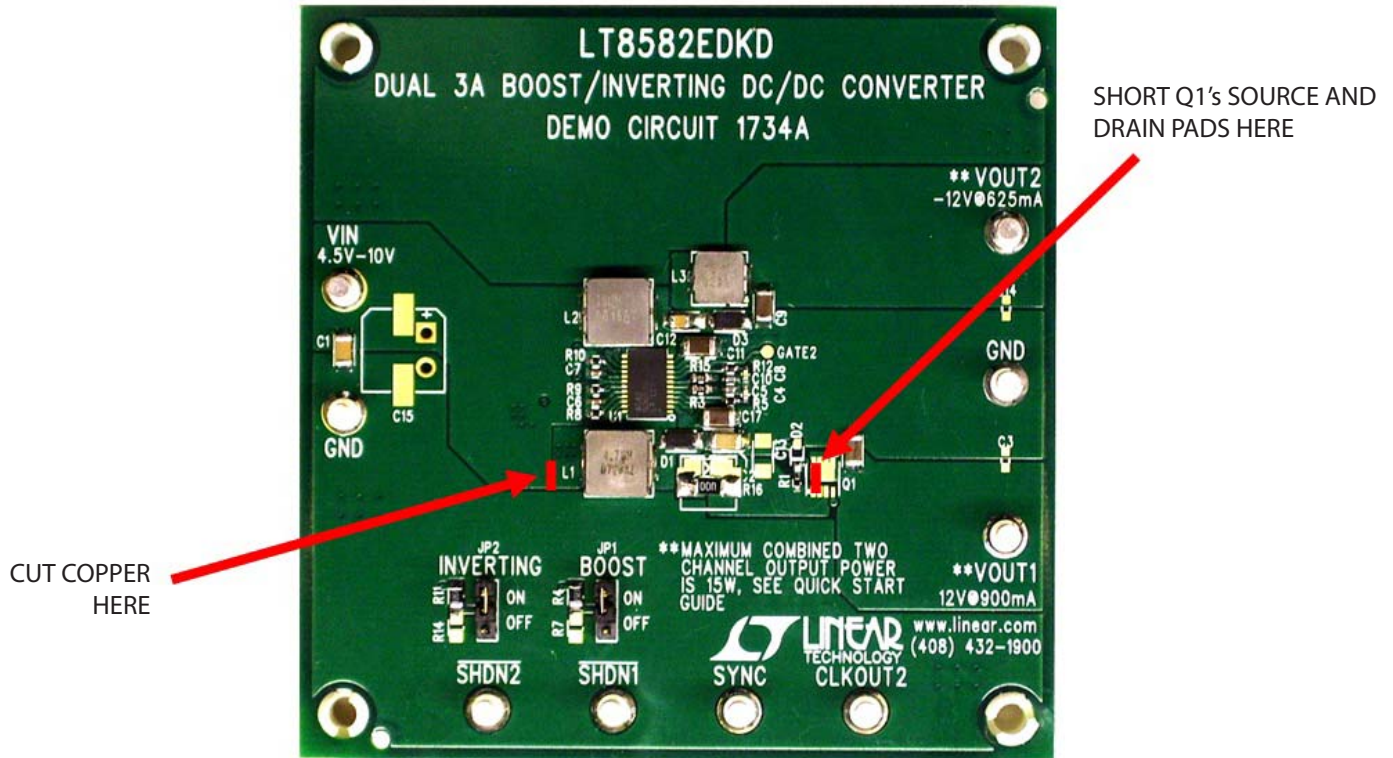


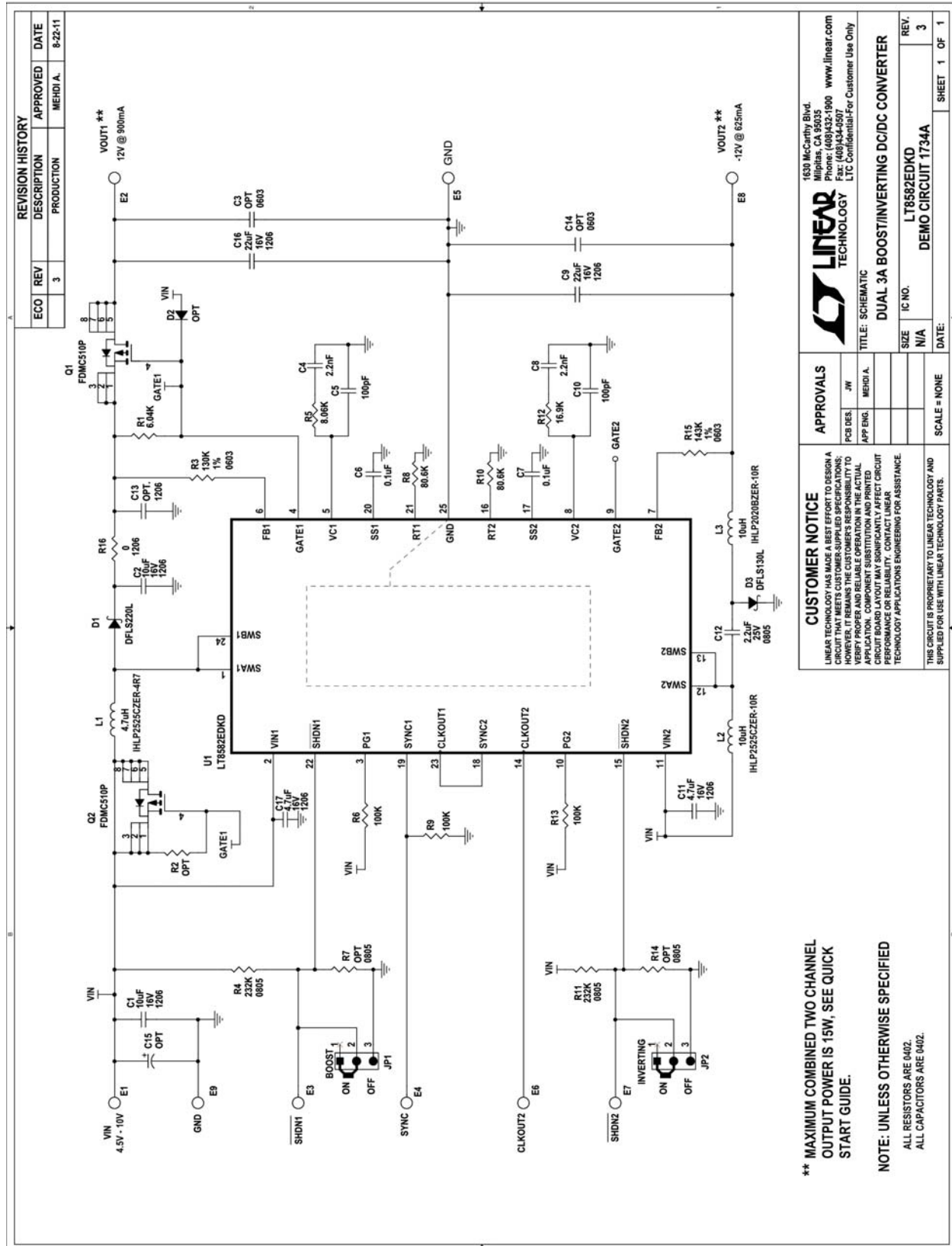
Figure 6. Using Channel 1 Input Disconnect Option (See Text)

# DEMO MANUAL DC1734A

## PARTS LIST

| ITEM                                            | QTY | REFERENCE   | PART DESCRIPTION                          | MANUFACTURER/PART NUMBER          |
|-------------------------------------------------|-----|-------------|-------------------------------------------|-----------------------------------|
| <b>Required Circuit Components</b>              |     |             |                                           |                                   |
| 1                                               | 3   | C1, C2      | CAP, X5R, 10 $\mu$ F, 16V, 20% 1206       | AVX, 1206YD106MAT2A               |
| 2                                               | 1   | C9, C16     | CAP, X5R, 22 $\mu$ F, 16V, 20% 1206       | TAIYO YUDEN, EMK316BJ226ML-T      |
| 3                                               | 2   | C11, C17    | CAP, X5R, 4.7 $\mu$ F, 16V, 20% 1206      | TAIYO YUDEN, EMK316BJ475ML-T      |
| 4                                               | 2   | C4, C8      | CAP, X7R, 2.2nF, 50V, 10%, 0402           | AVX, 04025C222KAT2A               |
| 5                                               | 2   | C5, C10     | CAP, NPO, 100pF, 16V, 10%, 0402           | AVX, 0402YA101KAT2A               |
| 6                                               | 2   | C6, C7      | CAP, X7R, 0.1 $\mu$ F, 16V, 10% 0402      | TDK, C1005X7R1C104K               |
| 7                                               | 1   | C12         | CAP, X7R, 2.2 $\mu$ F, 25V, 10%, 0805     | MURATA, GRM21BR71E225KA73L        |
| 8                                               | 1   | D1          | RECTIFIER, DFSL220L, PowerDI-123          | DIODES/ZETEX, DFSL220L-7          |
| 9                                               | 1   | D3          | RECTIFIER, DFSL130L, PowerDI-123          | DIODES/ZETEX, DFSL130L-7          |
| 10                                              | 1   | L1          | INDUCTOR, 4.7 $\mu$ H                     | VISHAY, IHLP2525CZER4R7M11        |
| 11                                              | 1   | L2          | INDUCTOR, 10 $\mu$ H                      | VISHAY, IHLP2525CZER100M11        |
| 12                                              | 1   | L3          | INDUCTOR, 10 $\mu$ H                      | VISHAY, IHLP2020BZER100M11        |
| 13                                              | 1   | Q1          | P-CH MOSFET, FDMC510P, POWER-33           | FAIRCHILD, FDMC510P               |
| 14                                              | 1   | R1          | RES., CHIP, 6.04k, 1/16W, 1% 0402         | VISHAY, CRCW04026K04FKED          |
| 15                                              | 1   | R3          | RES., CHIP, 130k, 1/10W, 1%, 0603         | NIC, NRC06F1303TRF                |
| 16                                              | 2   | R4, R11     | RES., CHIP, 232k, 1/8W, 1%, 0805          | VISHAY, CRCW0805232KFKEA          |
| 17                                              | 1   | R5          | RES., CHIP, 8.06k, 1/16W, 1% 0402         | VISHAY, CRCW04028K06FKED          |
| 18                                              | 2   | R8, R10     | RES., CHIP, 80.6k, 1/16W, 1% 0402         | VISHAY, CRCW040280K6FKED          |
| 19                                              | 3   | R6, R9, R13 | RES., CHIP, 100k, 1/16W, 5% 0402          | NIC, NRC04J104TRF                 |
| 20                                              | 1   | R12         | RES., CHIP, 16.9k, 1/16W, 1% 0402         | VISHAY, CRCW040216K9FKED          |
| 21                                              | 1   | R15         | RES., CHIP, 143k, 1/10W, 1%, 0603         | NIC, NRC06F1433TRF                |
| 22                                              | 1   | R16         | RES., CHIP, 0 $\Omega$ , 1/4W, 1206       | NIC, NRC12ZOTR                    |
| 23                                              | 1   | U1          | IC., LT8582EDKD, DFN-24(7MMX4MM)          | LINEAR TECH., LT8582EDKD          |
| <b>Additional Demo Board Circuit Components</b> |     |             |                                           |                                   |
| 1                                               | 0   | C3, C14     | CAP, 0603, OPTION                         |                                   |
| 2                                               | 0   | C13         | CAP, 1206, OPTION                         |                                   |
| 3                                               | 0   | C15         | CAP, SMD 8X10.5 & THRU HOLE 8X9.5, OPTION |                                   |
| 4                                               | 0   | D2          | DIODE, SOD-323, OPTION                    |                                   |
| 5                                               | 0   | Q2          | MOSFET, POWER-33, OPTION                  |                                   |
| 6                                               | 0   | R2          | RES., CHIP, 0402, OPTION                  |                                   |
| 7                                               | 0   | R7, R14     | RES., CHIP, 0805, OPTION                  |                                   |
| <b>Hardware for Demo Board Only</b>             |     |             |                                           |                                   |
| 1                                               | 9   | E1-E9       | TESTPOINT, TURRET, .094" pbf              | MILL-MAX, 2501-2-00-80-00-00-07-0 |
| 2                                               | 2   | JP1, JP2    | 3 PIN 0.079 SINGLE ROW HEADER             | SAMTEC, TMM103-02-L-S             |
| 3                                               | 2   | XJP1, XJP2  | SHUNT, .079" CENTER                       | SAMTEC, 2SN-BK-G                  |
| 4                                               | 4   | (STAND-OFF) | STAND-OFF, NYLON 0.25"                    | KEYSTONE, 8831(SNAP ON)           |
| 5                                               | 1   |             | FAB, PRINTED CIRCUIT BOARD                | DEMO CIRCUIT 1734A                |

## SCHEMATIC DIAGRAM



# DEMO MANUAL DC1734A

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