

# LTM4614EV: Dual 4A Step-Down $\mu$ Module<sup>®</sup> Regulator

## DESCRIPTION

Demonstration circuit DC1385A features the LTM<sup>®</sup>4614EV, the high efficiency, high density power module with dual 4A switch mode outputs. Derating is necessary for certain  $V_{IN}$ ,  $V_{OUT}$ , and thermal conditions. In the default configuration, the two outputs share the same input supply, however each regulator may have its own input supply simply by removing a resistor. By enabling the tracking feature, the outputs

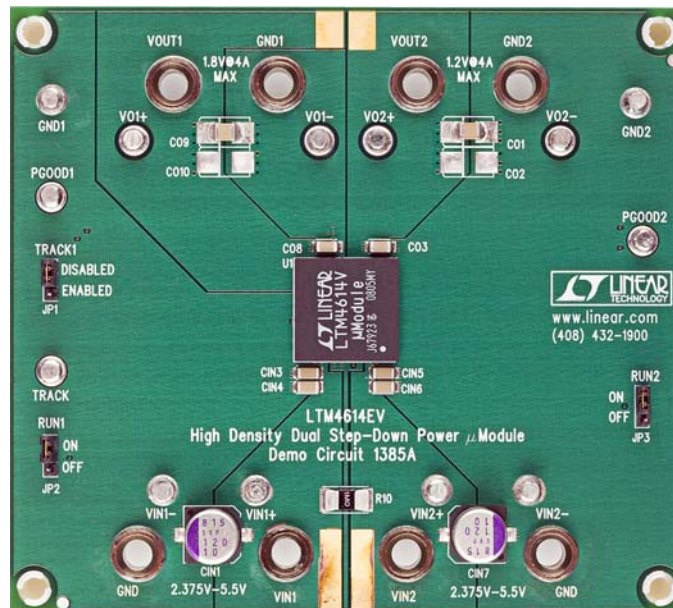
coincidentally follow another supply rail. The LTM4614 data sheet must be read in conjunction with this demo board prior to working on or modifying demo circuit DC1477A. **Design files for this circuit board are available at <http://www.linear.com/demo>**

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

| PARAMETER                              | CONDITIONS  | VALUE  |
|--|---|--|
| Input Voltage Range                    | $V_{IN1}$ and $V_{IN2}$   | 2.375V to 5.5V   |
| Output Voltage $V_{OUT1}$ , $V_{OUT2}$ | $V_{IN} = 5V_{DC}$ ,<br>$I_{OUT1}$ , $I_{OUT2} = 4A$ .  | $V_{OUT1} = 1.8V \pm 2\%$ ,<br>$V_{OUT2} = 1.2V \pm 2\%$ |
| Maximum Continuous Output Current      | Derating is Necessary for Certain $V_{IN}$ , $V_{OUT}$ , and Thermal Conditions, See Data Sheet for Details | $4A_{DC}$ for $V_{OUT1}$ , $V_{OUT2}$                    |
| Default Operating Frequency            |   | 1.25MHz  |
| Efficiency of Channel 1                | $V_{IN1} = 5V$ , $V_{OUT1} = 1.8V$ , $I_{OUT1} = 4A$  | 81.5%, See Figure 3                                      |
| Efficiency of Channel 2                | $V_{IN2} = 5V$ , $V_{OUT2} = 1.2V$ , $I_{OUT2} = 4A$  | 75.4%, See Figure 3                                      |

## BOARD PHOTO



dc1385af

## QUICK START PROCEDURE

Demonstration circuit DC1385A is an easy way to evaluate the performance of the LTM4614EV. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical 1.8V and 1.2V application:

| TRACK1   | RUN1 | RUN2 |
|----------|------|------|
| DISABLED | ON   | ON   |

2. With the power off, connect the input power supply, load and meters as shown in Figure 1. Preset the loads to 0A and  $V_{IN}$  supply to be less than 5.5V.
3. Turn on the power at the input. The output voltage between  $VO1^+$  and  $VO1^-$  should be  $1.8V \pm 2\%$ , and the voltage between  $VO2^+$  and  $VO2^-$  should be  $1.2V \pm 2\%$ .
4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters. To measure input and output ripple, please refer to Figure 2 for proper setup.

5. Channel 1 can track another supply by connecting TP17, TRACK to another supply and setting JP1 to ENABLED. Resistors R8 and R9 are set up for coincidental tracking. Channel 2 is set up to coincidentally track the output of channel 1 by resistor R6 and R7. Please refer to the circuit schematic and data sheet.
6. Because DC1385A is assembled in a way that  $V_{OUT2}$  tracks  $V_{OUT1}$  automatically, placing the JP2 (RUN1) to OFF position turns off both outputs. To disable tracking function of  $V_{OUT2}$ , please remove R6 and R7 and connect TRACK2 to  $V_{IN2}$ .
7.  $V_{IN1}$  and  $V_{IN2}$  are shorted on DC1385A through a 1mohm resistor, R10. If desired, remove R10 and different supplies can be applied to  $V_{IN1}$  and  $V_{IN2}$  of this demo circuit.

**QUICK START PROCEDURE**

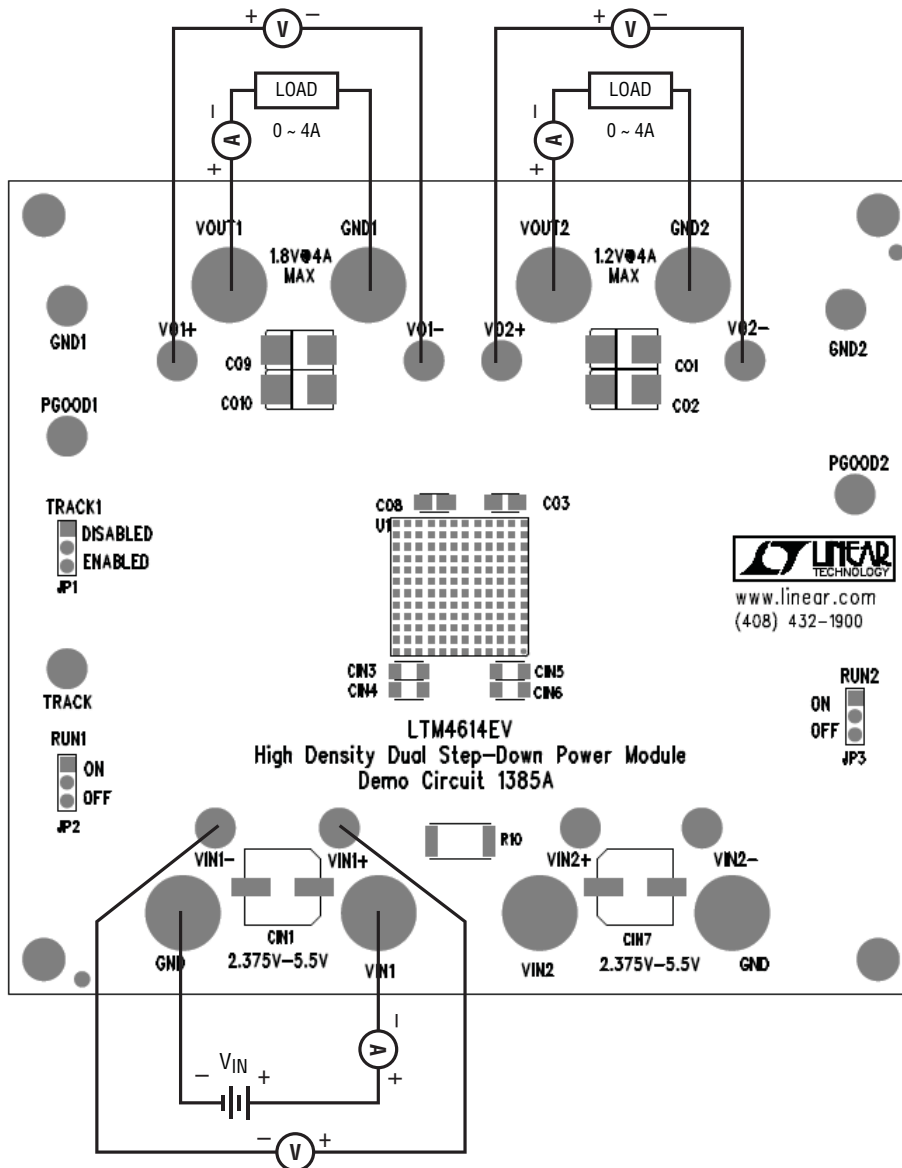


Figure 1. Test Setup of DC1385A

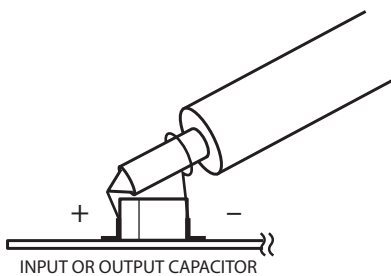


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

QUICK START PROCEDURE

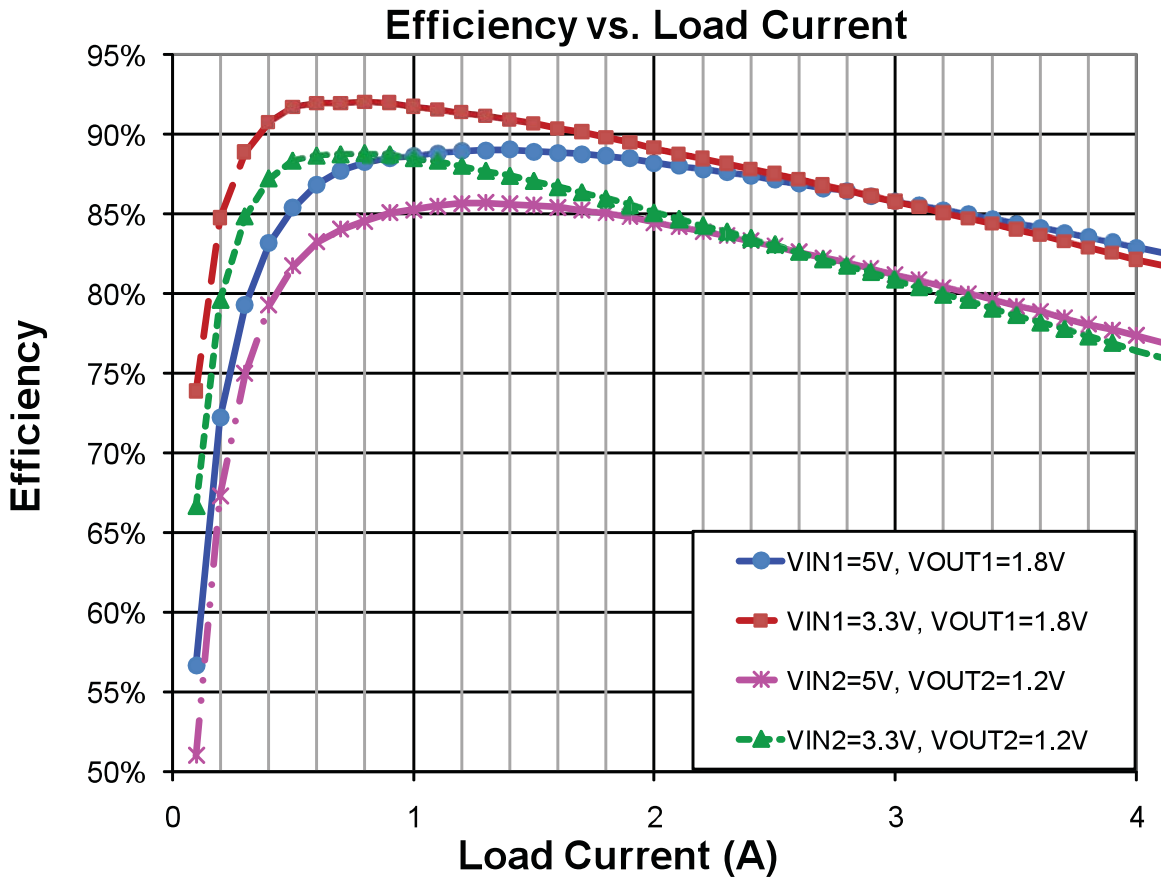
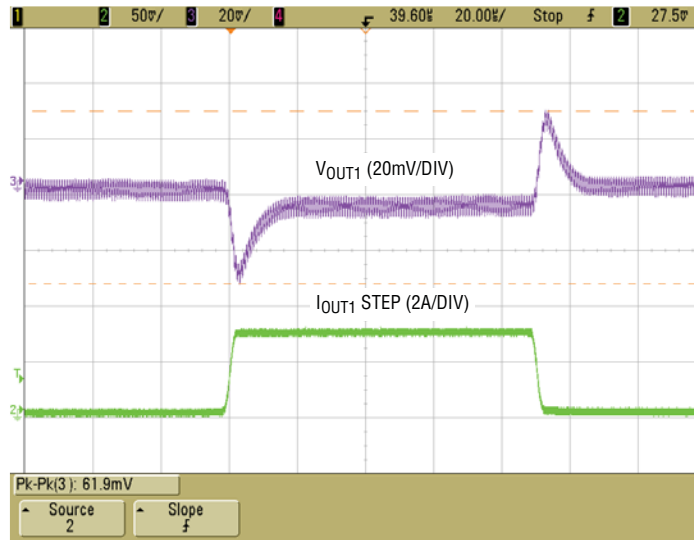


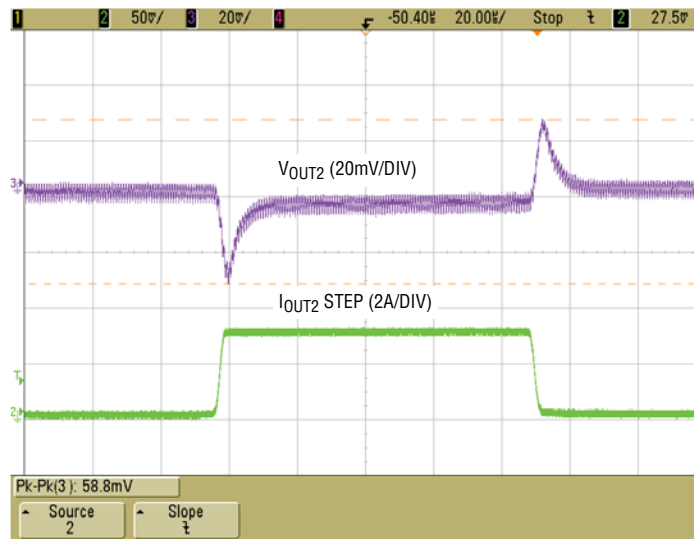
Figure 3. Measured Efficiency for Different Channels

**QUICK START PROCEDURE**



$V_{IN1} = 5V$   
 $V_{OUT1} = 1.8V$   
 CONTINUOUS CURRENT MODE (CCM)  
 1A TO 4A LOAD STEP ON  $V_{OUT1}$   
 $C_{OUT1} = 100\mu F$  CERAMIC (1210, X5R, 6.3V) +  $22\mu F$  CERAMIC (1206, X5R, 6.3V)

**Figure 4. Measured Load Transient Response for  $V_{OUT1}$**



$V_{IN2} = 5V$   
 $V_{OUT2} = 1.2V$   
 CONTINUOUS CURRENT MODE (CCM)  
 1A TO 4A LOAD STEP ON  $V_{OUT2}$   
 $C_{OUT2} = 100\mu F$  CERAMIC (1210, X5R, 6.3V) +  $22\mu F$  CERAMIC (1206, X5R, 6.3V)

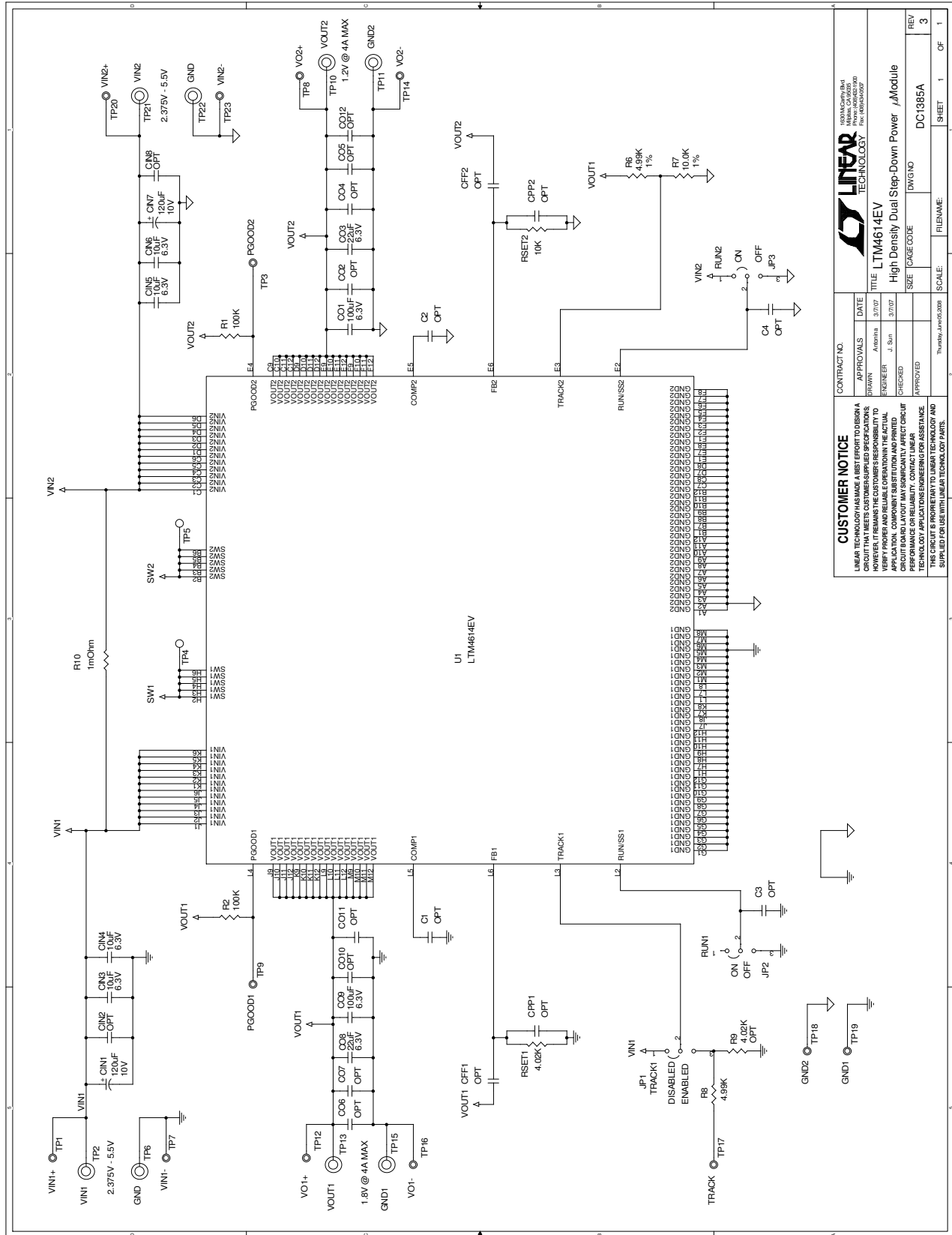
**Figure 5. Measured Load Transient Response for  $V_{OUT2}$**

# DEMO MANUAL DC1385A

## PARTS LIST

| ITEM  | QTY | REFERENCE                                       | PART DESCRIPTION                   | MANUFACTURER/PART NUMBER          |
|---|-----|---|------------------------------------|-----------------------------------|
| <b>Required Circuit Components</b>              |     |   |                                    |                                   |
| 1   | 2   | CIN1, CIN7                                      | CAP, OSCON 120uF, 10V, E7          | SANYO, 10SVP120M                  |
| 2   | 4   | CIN3, CIN4, CIN5, CIN6                          | CAP, X5R, 10uF, 6.3V, 20%, 1206    | AVX, 12066D106MAT2A               |
| 3   | 2   | CO3, CO8  | CAP, X5R, 22uF, 6.3V, 20%, 1206    | AVX, 12066D226MAT2A               |
| 4   | 2   | CO1, CO9  | CAP, X5R, 100uF, 6.3V, 20%, 1210   | AVX, 12106D107MAT2A               |
| 5   | 1   | RSET1   | RES., CHIP, 4.02k, 1/16W, 1%, 0402 | VISHAY, CRCW04024K02FKED          |
| 6   | 1   | RSET2   | RES., CHIP, 10.0k, 1/16W, 1%, 0402 | VISHAY, CRCW040210K0FKED          |
| 7   | 2   | R2, R1  | RES., CHIP, 100k, 1/16W, 1%, 0402  | VISHAY, CRCW0402100KFKED          |
| 8   | 1   | U1  | I.C. LTM4614EV 144 PIN LGA         | LINEAR TECH., LTM4614EV           |
| <b>Additional Demo Board Circuit Components</b> |     |   |                                    |                                   |
| 1   | 0   | CPP1, CFF1, CPP2, CFF2                          | CAP, 0402, OPT                     |                                   |
| 2   | 0   | CIN2, CIN8, CO11, CO12                          | CAP, 1206, OPT                     |                                   |
| 3   | 0   | CO2, CO4, CO5, CO6, CO7, CO10                   | CAP, 7343, OPT                     | CAP7343                           |
| 4   | 0   | C1, C2, C3, C4                                  | CAP, 0402, OPT                     |                                   |
| 5   | 1   | R9  | RES., CHIP, 4.02k, 1/16W, 1%, 0402 | VISHAY, CRCW04024K02FKED          |
| 6   | 1   | R7  | RES., CHIP, 10.0k, 1/16W, 1%, 0402 | VISHAY, CRCW040210K0FKED          |
| 7   | 2   | R8, R6  | RES., CHIP, 4.99k, 1/16W, 1%, 0402 | VISHAY, CRCW04024K99FKED          |
| 8   | 1   | R10   | RES., CHIP, 1mΩ, 1W, 5%, 2512      | PANASONIC, ERJM1WTJ1MOV           |
| <b>Hardware-For Demo Board Only</b>             |     |   |                                    |                                   |
| 1   | 3   | JP1, JP2, JP3                                   | HEADER 3 PIN 0.079 SINGLE ROW      | SAMTEC, TMM103-02-L-S             |
| 2   | 3   | JPX1, JPX2, JPX3                                | SHUNT, 0.079" CENTER               | SAMTEC, 2SN-BK-G                  |
| 3   | 13  | TP1, TP3, TP7-9, TP12,<br>TP14, TP16-20, TP23   | TESTPOINT, TURRET, 0.094" PBF      | MILL-MAX, 2501-2-00-80-00-00-07-0 |
| 4   | 8   | TP2, TP6, TP10, TP11, TP13,<br>TP15, TP21, TP22 | JACK BANANA                        | KEYSTONE, 575-4                   |
| 5   | 4   | (STAND-OFF)                                     | STAND-OFF, NYLON 0.50"             | KEYSTONE, 8833(SNAP ON)           |

## SCHEMATIC DIAGRAM



|   |  |              |           |              |
|---|--|--------------|-----------|--------------|
| <b>CUSTOMER NOTICE</b>  |  | CONTRACT NO. | APPROVALS | DATE         |
| LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SPECIFIED SPECIFICATIONS. HOWEVER, CUSTOMERS ARE RESPONSIBLE FOR VERIFYING THAT THE ACTUAL COMPONENTS AND THE ACTUAL APPLICATION COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE. CUSTOMERS SHOULD CONSULT WITH LINEAR TECHNOLOGY APPLICATION ENGINEERING FOR ASSISTANCE. |  | DRAWN        | APPROVED  | 3/7/02       |
| THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.   |  | ENGINEER     | DATE      | 3/7/02       |
|   |  | CHECKED      | DATE      | 3/7/02       |
|   |  | APPROVED     | DATE      |              |
|   |  | FILE NAME    | SCALE     | SHEET 1 OF 1 |
|   |  | TITLE        | DC1385A   | REV 3        |
|   |  | SIZE         | DWG NO    |              |
|   |  | PACKAGE CODE |           |              |
|   |  | REV          |           |              |



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# DEMO MANUAL DC1385A

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