

### LTC6604-2.5, LTC6604-5, LTC6604-10 and LTC6604-15

#### Dual, Matched, Fully-Differential, Lowpass Filter

## DESCRIPTION

Demonstration circuit 1418 features the LT6604-XX series of a dual, matched, fully differential 4<sup>th</sup> order lowpass filter approximating a Chebyshev frequency response. The cutoff frequencies ( $F_c$ ) of LT6604-XX are: 2.5MHz, 5MHz, 10MHz and 15MHz. (see Table 1). The LT6604-XX combines a lowpass filter with two fully differential matched amplifiers for driving the differential inputs of a dual analog to Digital Converter (ADC) and band-limiting the baseband signal of digital communications receiver. Each LT6604-XX filter IC requires only two external input resistors to set the filter's differential gain. A DC1418 board contains an LT6604-XX configured with input resistors as two unity gain differential amplifiers/lowpass filters.

Gains greater than one require changing the input resistors to a lower value (refer to an LTC6604-XX data sheet and the DC1418 schematic).

Connection to the differential input and output of a DC1418 is through SMA connectors. On-board jumpers configure the DC1418 for dual or single supply operation and internal or external output common (VOCM) mode biasing. The differential input of a DC1418 is AC coupled and can be configured for DC coupling by replacing shorting the input capacitors with zero ohms surface-mount resistor jumpers. In addition, the DC1418 has surface-mount pads to add input passive components for input signal filtering and DC biasing.

**Design files for this circuit board are available.**

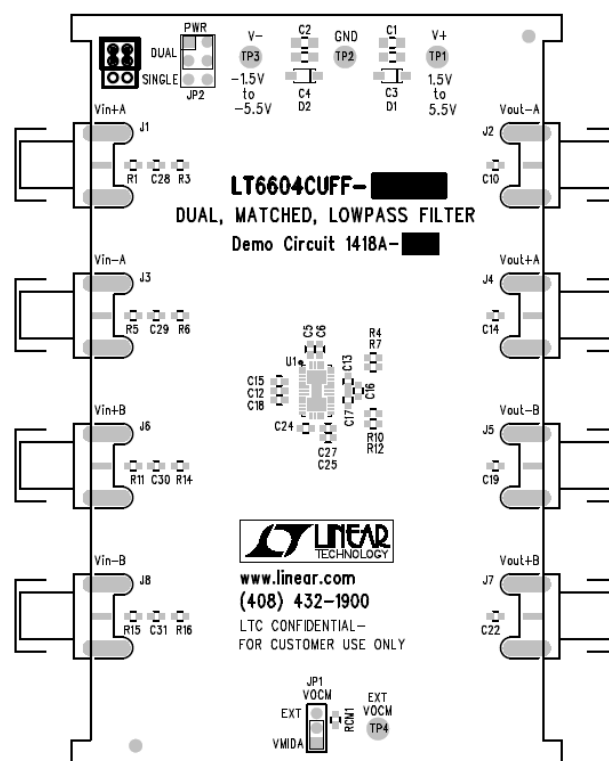
**Call the LTC factory.**

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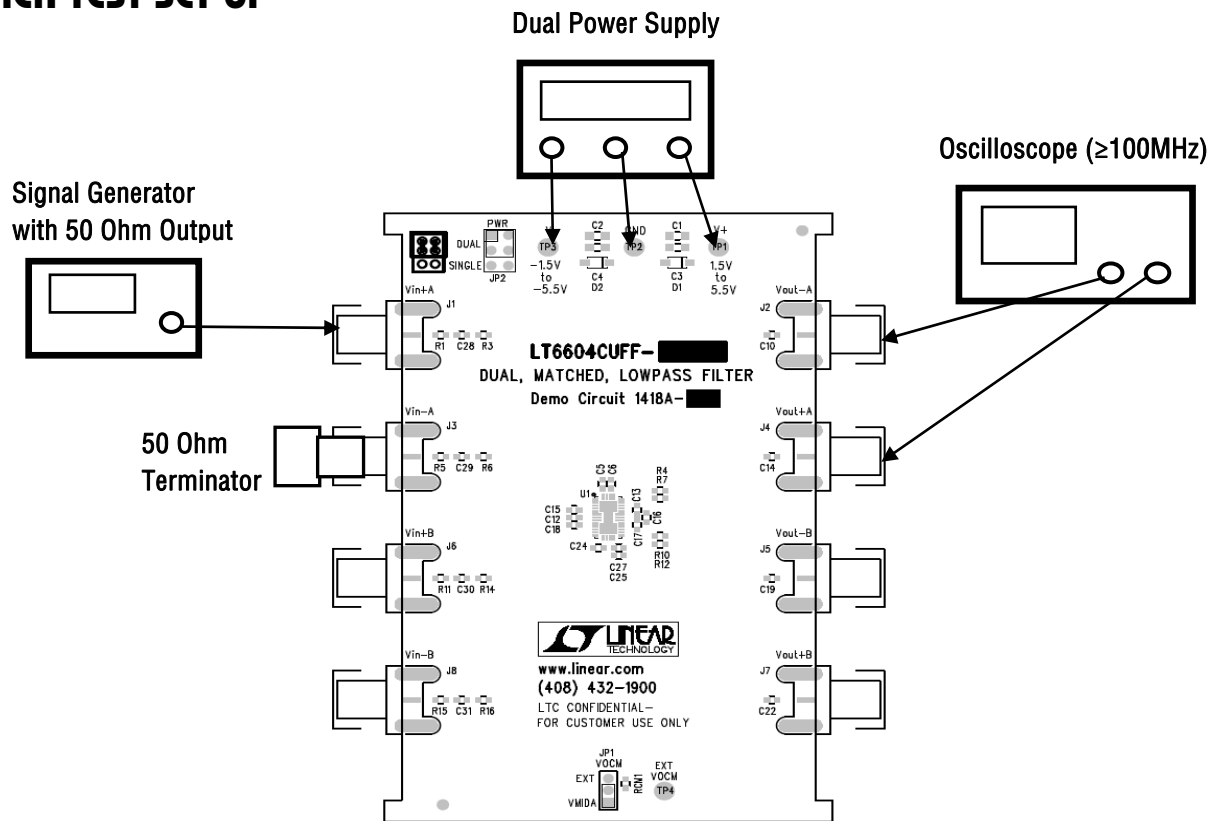
Table 1. The DC1418 Assemblies

| ASSEMBLY  |                                    |
|-----------|------------------------------------|
| DC1418A-A | LTC6604-2.5, $F_c = 2.5\text{MHz}$ |
| DC1418A-B | LTC6604-5, $F_c = 5\text{MHz}$     |
| DC1418A-C | LTC6604-10, $F_c = 10\text{MHz}$   |
| DC1418A-D | LTC6604-15, $F_c = 15\text{MHz}$   |

Figure 1. The DC1418 Top Silk Screen



## QUICK TEST SET UP



**Figure 2. Dual Supply Test Set Up Connections**  
(set the JP1 shunt to VMIDA and the JP2 shunt to DUAL).

### Quick Test Procedure

A DC1418 has two pairs of differential inputs, Vin+A/Vin-A and Vin+B/Vin-B and two pairs of differential outputs Vout-A/Vout+A and Vout-B/Vout-B.

#### 1. Testing the VinA to VoutA Signal Path.

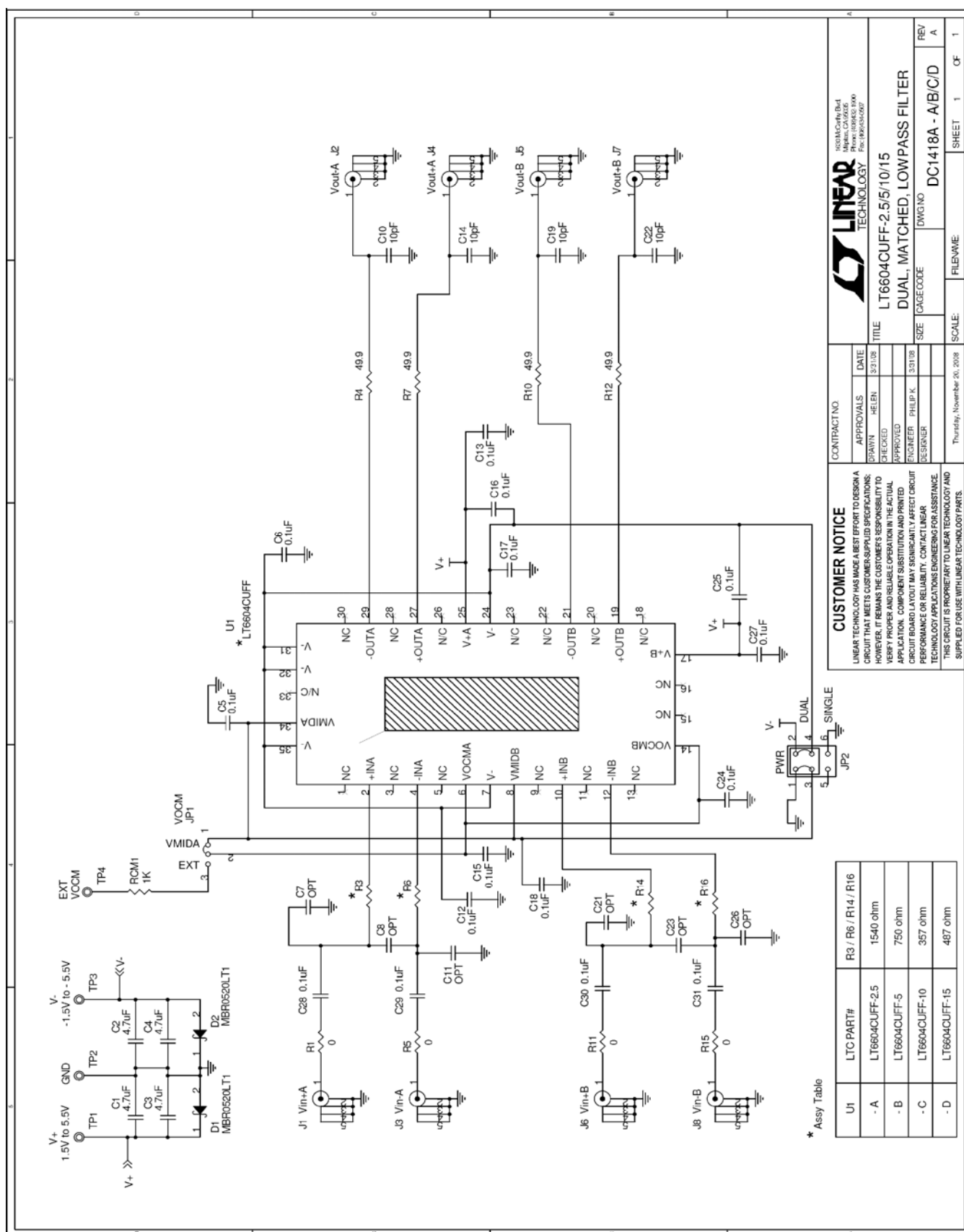
Connect a DC1418 board as shown in Figure 2 (connect signal generator to Vin+A and terminate Vin-A with a 50 ohm terminator). Set the generator for a 1MHz, 2Vp-p, and sinewave. The oscilloscope channels connected to Vout-A and Vout+A show a 1MHz, 1Vp-p, sinewave (see Note 1).

#### 2. Testing the VinB to VoutB Signal Path.

Connect signal generator to Vin+B and terminate Vin-B with a 50 ohm terminator. Set the generator for a 1MHz, 2Vp-p, and sinewave. Connect oscilloscope channel 1 to Vout-B and channel 2 to Vout+B. The oscilloscope channels connected to Vout-B and Vout+B show a 1MHz, 1Vp-p, sinewave.

**Note 1:** For unity gain testing the DC1418 inputs must be ideally driven by a zero ohm source (the outputs of a high speed differential amplifier). However with the 50 ohm impedance of the generator's output and terminator is in series with the input resistors and the input to output gain is less than one.

**Note 2:** For single supply testing set the JP2 shunt to SINGLE.



**DC1418A General Parts List**

| Item | Qty | Reference                                         | Part Description                        | Manufacturer / Part #            |
|------|-----|---------------------------------------------------|-----------------------------------------|----------------------------------|
| 1    | 4   | C1,C2,C3,C4                                       | CAP., X5R 4.7 $\mu$ F 16V 0805          | KEMET, C0805C475M4PAC            |
| 2    | 15  | C5,C6,C12,C13,C15,C16,<br>C17,C18,C24,C25,C27-C31 | CAP., X7R 0.1 $\mu$ F 16V 0603          | AVX, 0603YC104KAT                |
| 3    | 0   | C7,C8,C11,C21,C23,C26(OPT)                        | CAP., 0603                              |                                  |
| 4    | 4   | C10,C14,C19,C22                                   | CAP., COG 10pF 25V 0603                 | AVX, 06033A100KAT                |
| 5    | 2   | D1,D2                                             | DIODE, schottky power rectifier SOD-123 | ON-SEMI, MBR0520LT1G             |
| 6    | 1   | JP1                                               | HEADER, 3Pin 1 Row .079CC               | SAMTEC, TMM-103-02-L-S           |
| 7    | 1   | JP2                                               | HEADER, .1 DOUBLE ROW, 2X3 PIN          | SAMTEC, TSW-103-07-L-D           |
| 8    | 1   | JP1                                               | SHUNT, .079" Center                     | SAMTEC, 2SN-BK-G                 |
| 9    | 1   | JP2                                               | SHUNT, .1" Center                       | SAMTEC, MNT-102-BK-G             |
| 10   | 8   | J1-J8                                             | CONN. SMA 50-OHM EDGE-LAUNCH            | Amphenol Connex, 132357          |
| 11   | 4   | TP1-TP4                                           | TESTPOINT, TURRET, 065"                 | MILL-MAX 2308-2-00-80-00-00-07-0 |
| 12   | 1   | RCM1                                              | RES., CHIP, 1K $\Omega$ , 1%, 0603      | VISHAY, CRCW06031K00FKEA         |
| 13   | 4   | R1,R5,R11,R15                                     | RES., CHIP, 0 $\Omega$ , 0603           | VISHAY, CRCW06030000Z0EA         |
| 14   | 4   | R4,R7,R10,R12                                     | RES., CHIP, 49.9 $\Omega$ , 1%, 0603    | VISHAY, CRCW060349R9FKEA         |

**DC1418A-A**

| Item | Qty | Reference     | Part Description                 | Manufacturer / Part #           |
|------|-----|---------------|----------------------------------|---------------------------------|
| 1    | 1   | DC1418A       | DC1418A GENERAL BOM              |                                 |
| 2    | 4   | R3,R6,R14,R16 | RES., CER. 1540 $\Omega$ 1% 0603 | VISHAY, CRCW06031K54FKEA        |
| 3    | 1   | U1            | IC, LT6604CUFF-2.5#PBF QFN       | LINEAR TECH. LT6604CUFF-2.5#PBF |
| 4    | 1   |               | FAB, PRINTED CIRCUIT BOARD       | DEMO CIRCUIT 1418A-A            |

**DC1418A-B**

| Item | Qty | Reference     | Part Description                | Manufacturer / Part #         |
|------|-----|---------------|---------------------------------|-------------------------------|
| 1    | 1   | DC1418A       | DC1418A GENERAL BOM             |                               |
| 2    | 4   | R3,R6,R14,R16 | RES., CER. 750 $\Omega$ 1% 0603 | VISHAY, CRCW0603750RFKEA      |
| 3    | 1   | U1            | I.C., LT6604CUFF-5#PBF, QFN     | LINEAR TECH. LT6604CUFF-5#PBF |
| 4    | 1   |               | FAB, PRINTED CIRCUIT BOARD      | DEMO CIRCUIT 1418A-B          |

**DC1418A-C**

| Item | Qty | Reference     | Part Description                | Manufacturer / Part #          |
|------|-----|---------------|---------------------------------|--------------------------------|
| 1    | 1   | DC1418A       | DC1418A GENERAL BOM             |                                |
| 2    | 4   | R3,R6,R14,R16 | RES., CER. 357 $\Omega$ 1% 0603 | VISHAY, CRCW0603357RFKEA       |
| 3    | 1   | U1            | I.C., LT6604CUFF-10#PBF, QFN    | LINEAR TECH. LT6604CUFF-10#PBF |
| 4    | 1   |               | FAB, PRINTED CIRCUIT BOARD      | DEMO CIRCUIT 1418A-C           |

**DC1418A-D**

| Item | Qty | Reference     | Part Description                | Manufacturer / Part #          |
|------|-----|---------------|---------------------------------|--------------------------------|
| 1    | 1   | DC1418A       | DC1418A GENERAL BOM             |                                |
| 2    | 4   | R3,R6,R14,R16 | RES., CER. 487 $\Omega$ 1% 0603 | VISHAY, CRCW0603487RFKEA       |
| 3    | 1   | U1            | I.C., LT6604CUFF-15#PBF, QFN    | LINEAR TECH. LT6604CUFF-15#PBF |
| 4    | 1   |               | FAB, PRINTED CIRCUIT BOARD      | DEMO CIRCUIT 1418A-D           |