

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.**

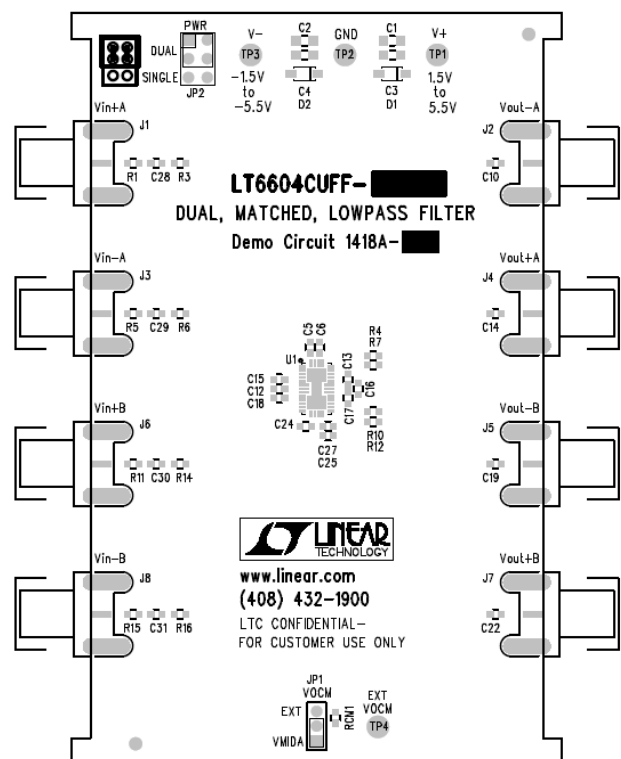
**Call the LTC factory.**

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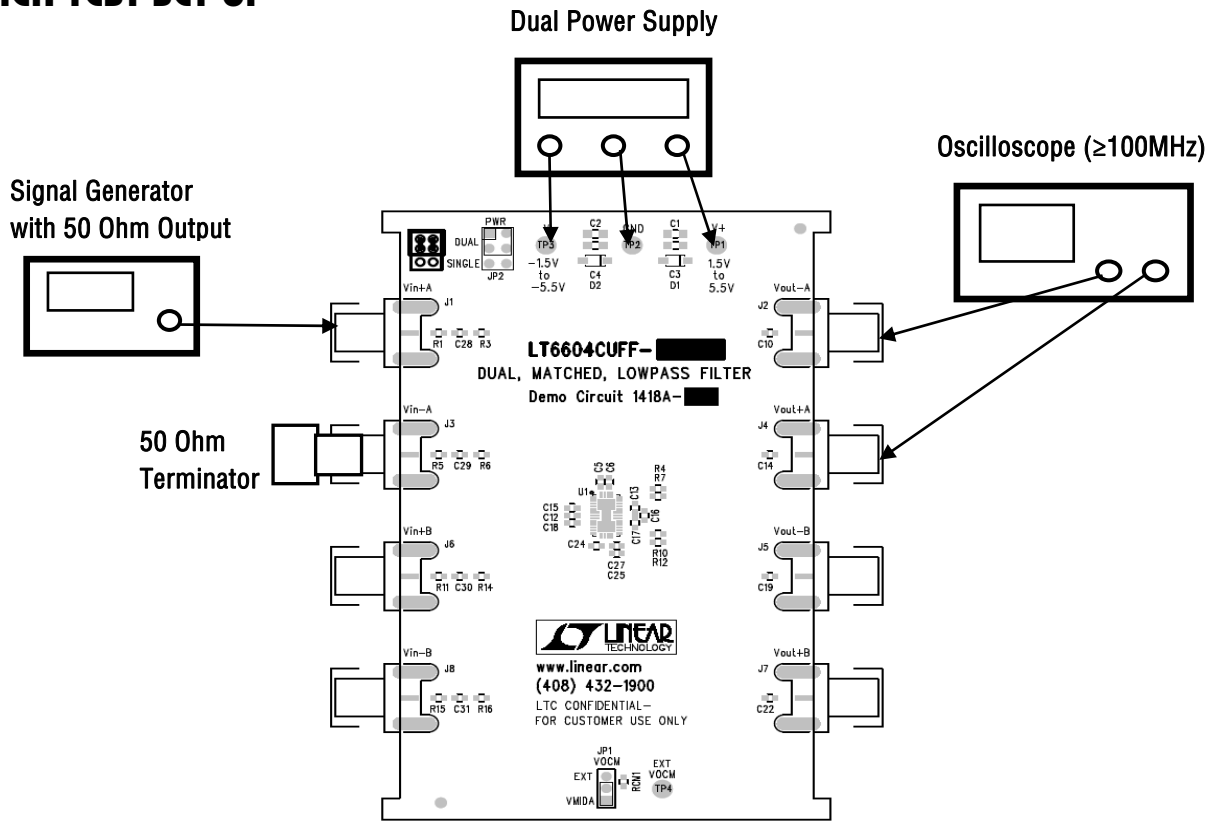
Table 1. The DC1418 Assemblies

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.**

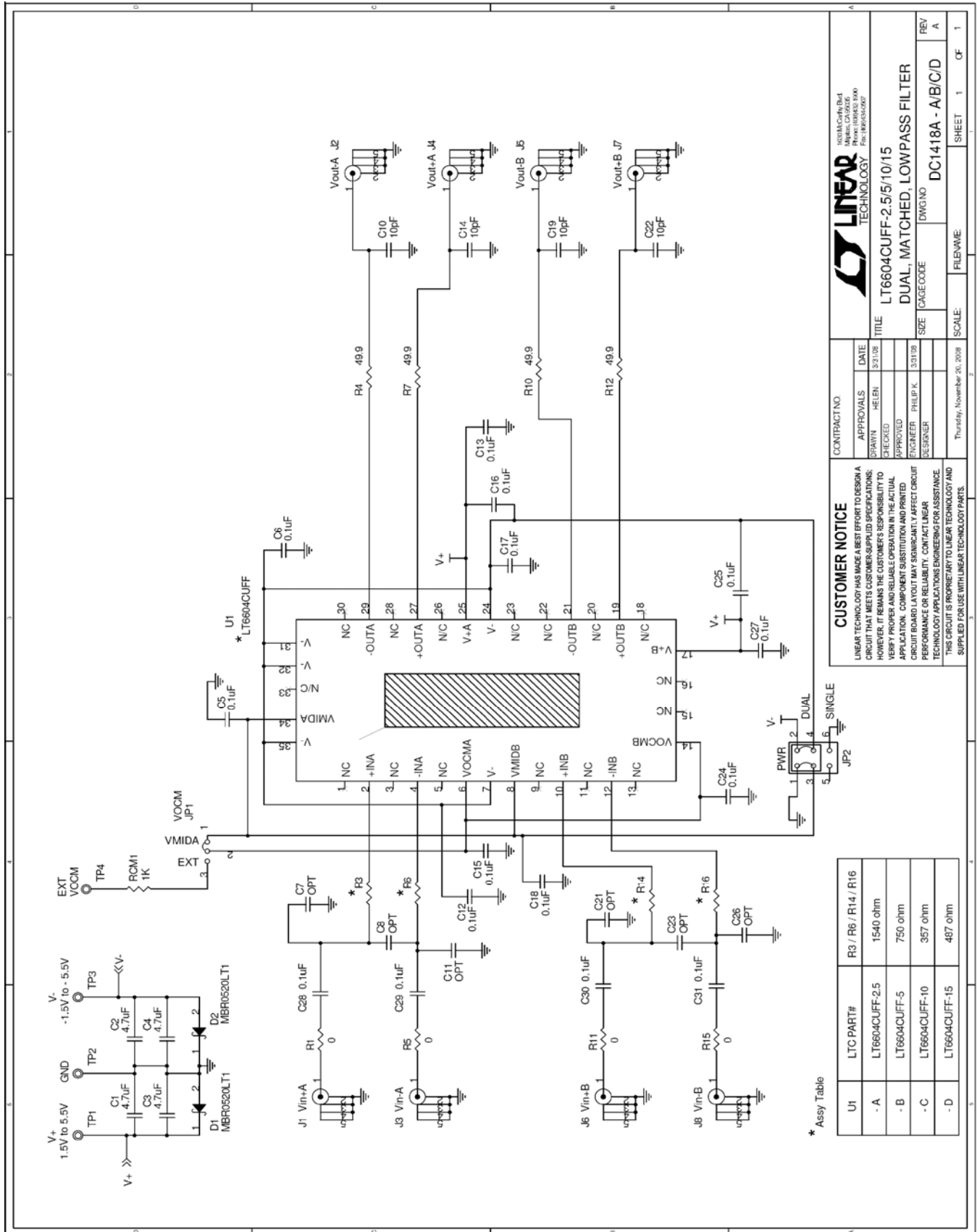
Connect a DC1418 board as shown in Figure 2 (connect signal generator to Vin+A and terminate Vin-A with a 50 ohm terminator). Set the generator for a 1MHz, 2Vp-p, and sinewave. The oscilloscope channels connected to Vout-A and Vout+A show a 1MHz, 1Vp-p, sinewave (see Note 1).

**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.



CONTRACT NO.		APPROVALS	DATE
DRAWN		CHECKED	3/21/08
APPROVED		DESIGNED	
ENGINEER - PHELIP K.		DESIGNER	
SIZE		DWG NO.	DC1418A - A/B/C/D
SCALE		FILE NAME	SHEET 1 OF 1

10001M, Corvina Blvd  
 Milpitas, CA 94528  
 408.253.1600  
**LINEAR TECHNOLOGY**  
 LT6604CUFF-2.5/10/15  
 DUAL, MATCHED, LOWPASS FILTER

EXT	VCCOM	TP4	RCM1	1K
V+	1.5V to 5.5V	TP1	C1	4.7uF
V-	-1.5V to -5.5V	TP3	C2	4.7uF
GND		TP2	C3	4.7uF
			C4	4.7uF
			D1	MBR0520LT1
			D2	MBR0520LT1
			R1	0
			C28	0.1uF
			R3	OPT
			C8	OPT
			R5	0
			C29	0.1uF
			R6	OPT
			C11	OPT
			C12	0.1uF
			C15	0.1uF
			C18	0.1uF
			C30	0.1uF
			R11	0
			C21	OPT
			R4	OPT
			C23	OPT
			R15	0
			C31	0.1uF
			R16	OPT
			C26	OPT
			C24	0.1uF
			C25	0.1uF
			C27	0.1uF
			C10	10pF
			C14	10pF
			C19	10pF
			C22	10pF
			C13	0.1uF
			C16	0.1uF
			C17	0.1uF
			C18	0.1uF
			C20	0.1uF
			C21	0.1uF
			C23	0.1uF
			C26	0.1uF
			C27	0.1uF
			C28	0.1uF
			C29	0.1uF
			C30	0.1uF
			C31	0.1uF
			C32	0.1uF
			C33	0.1uF
			C34	0.1uF
			C35	0.1uF
			C36	0.1uF
			C37	0.1uF
			C38	0.1uF
			C39	0.1uF
			C40	0.1uF
			C41	0.1uF
			C42	0.1uF
			C43	0.1uF
			C44	0.1uF
			C45	0.1uF
			C46	0.1uF
			C47	0.1uF
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			C49	0.1uF
			C50	0.1uF
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			C81	0.1uF
			C82	0.1uF
			C83	0.1uF
			C84	0.1uF
			C85	0.1uF
			C86	0.1uF
			C87	0.1uF
			C88	0.1uF
			C89	0.1uF
			C90	0.1uF
			C91	0.1uF
			C92	0.1uF
			C93	0.1uF
			C94	0.1uF
			C95	0.1uF
			C96	0.1uF
			C97	0.1uF
			C98	0.1uF
			C99	0.1uF
			C100	0.1uF

**DC1418A General Parts List**

Item	Qty	Reference	Part Description	Manufacturer / Part #
1	4	C1,C2,C3,C4	CAP., X5R 4.7µF 16V 0805	KEMET, C0805C475M4PAC
2	15	C5,C6,C12,C13,C15,C16, C17,C18,C24,C25,C27-C31	CAP., X7R 0.1µF 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, 1KΩ, 1%, 0603	VISHAY, CRCW06031K00FKEA
13	4	R1,R5,R11,R15	RES., CHIP, 0Ω, 0603	VISHAY, CRCW06030000Z0EA
14	4	R4,R7,R10,R12	RES., CHIP, 49.9Ω, 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. 1540Ω 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. 750Ω 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. 357Ω 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. 487Ω 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