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# Operational Amplifier Prototype Board

## Features

- ❑ Prototyping Platform for CS30xx Operational Amplifiers
- ❑ Support for Differential & Single-ended Inputs/Outputs
- ❑ Includes Op-amp Samples (two each of the following)
  - CS3001
  - CS3002
  - CS3011
  - CS3012      See [Table 1 on page 3](#).
  - CS3003
  - CS3004
  - CS3013
  - CS3014

## General Description

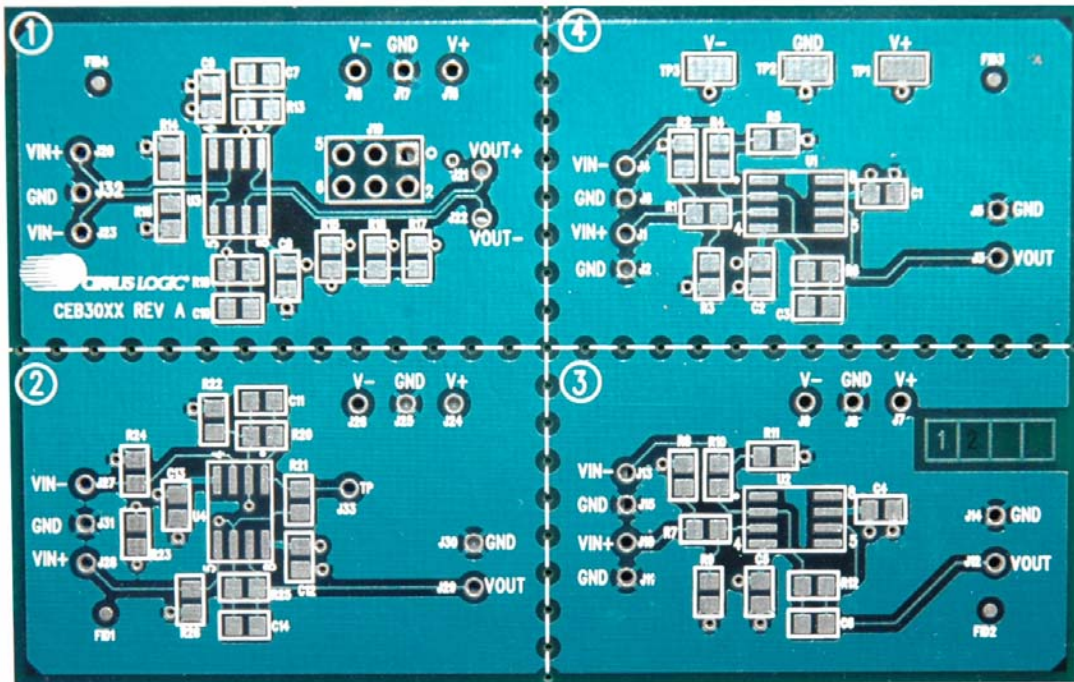
The CDB30xx is a blank circuit board that provides a prototyping platform for the CS30xx series of operational amplifiers. The board has four different circuit sections. The board can be used intact or it can be separated into four separate smaller boards. The power supply connection and grounds are all connected between the four sections unless the board is separated into its smaller sections.

The board is provided without components but a selection of Cirrus Logic operational amplifiers are provided as samples. The samples include two each of the CS3001, CS3002, CS3011, CS3012, CS3003, CS3004, CS3013, and CS3014 devices. Refer to [Table 1 on page 3](#) for a summary of features for the op-amps included with the CDB30xx.

## ORDERING INFORMATION

CDB30xx

Evaluation Board



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## 1. INTRODUCTION

There are four different sections of the board.

- Section 1 is a differential input, differential output amplifier configuration using a dual-amplifier pin out.
- Section 2 is a two op-amp, differential amplifier using a dual-amplifier pin out.
- Sections 3 and 4 are identical amplifier circuits (although they have different component designators for their components). These can be configured for either inverting gain or non-inverting gain configurations. Sections 3 and 4 use the single-amplifier pin out.

The following table provides a brief summary of features for the op-amps included with the CDB30xx board.

**Table 1. Typical Specifications for Cirrus Logic Chopper-stabilized Amplifiers**

Device	Channels	GBW	Voltage Noise	0.1 to 10 Hz Noise	Supply Range	R-to-R Input	R-to-R Output
3001	1	4 MHz	$6\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	125nV p-p @ 10 Hz	2.7 to 6.7	N	Y
3002	2	4 MHz	$6\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	125nV p-p @ 10 Hz	2.7 to 6.7	N	Y
3003	1	2 MHz	$17\text{nV}/\sqrt{\text{Hz}}$ @ 1 Hz	350nV p-p @ 10 Hz	2.7 to 5.5	Y	Y
3004	2	2 MHz	$17\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	350nV p-p @ 10 Hz	2.7 to 5.5	Y	Y
3011	1	2 MHz	$12\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	250nV p-p @ 10 Hz	2.7 to 6.7	N	Y
3012	2	2 MHz	$12\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	250nV p-p @ 10 Hz	2.7 to 6.7	N	Y
3013	1	1 MHz	$22\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	460nV p-p @ 10 Hz	2.7 to 5.5	Y	Y
3014	2	1 MHz	$22\text{nV}/\sqrt{\text{Hz}}$ @ 0.5 Hz	460nV p-p @ 10 Hz	2.7 to 5.5	Y	Y

For detailed information on the CS30xx ADCs, go to [www.cirrus.com](http://www.cirrus.com).

## 2. CIRCUIT 1 - DIFFERENTIAL INPUT / DIFFERENTIAL OUTPUT

Circuit 1 is a differential input / differential output amplifier. This circuit is commonly used to amplify the differential signal from a bridge transducer, such as a load cell. The amplified differential output signal is then input into an A/D converter that has a fully differential input.

For narrowband signals below 2 kHz, the CS3002 dual amplifier is a good choice for this amplifier configuration because it provides low noise and can be configured for gains as high as 2000X. Gain is set by the equation,

$$V_{OUT} = \left( (VIN+) - (VIN-) \right) \left( 1 + \frac{R13 + R19}{R_x} \right)$$

where  $R_x$  is R15, R16, or R17, selected by a jumper connection.

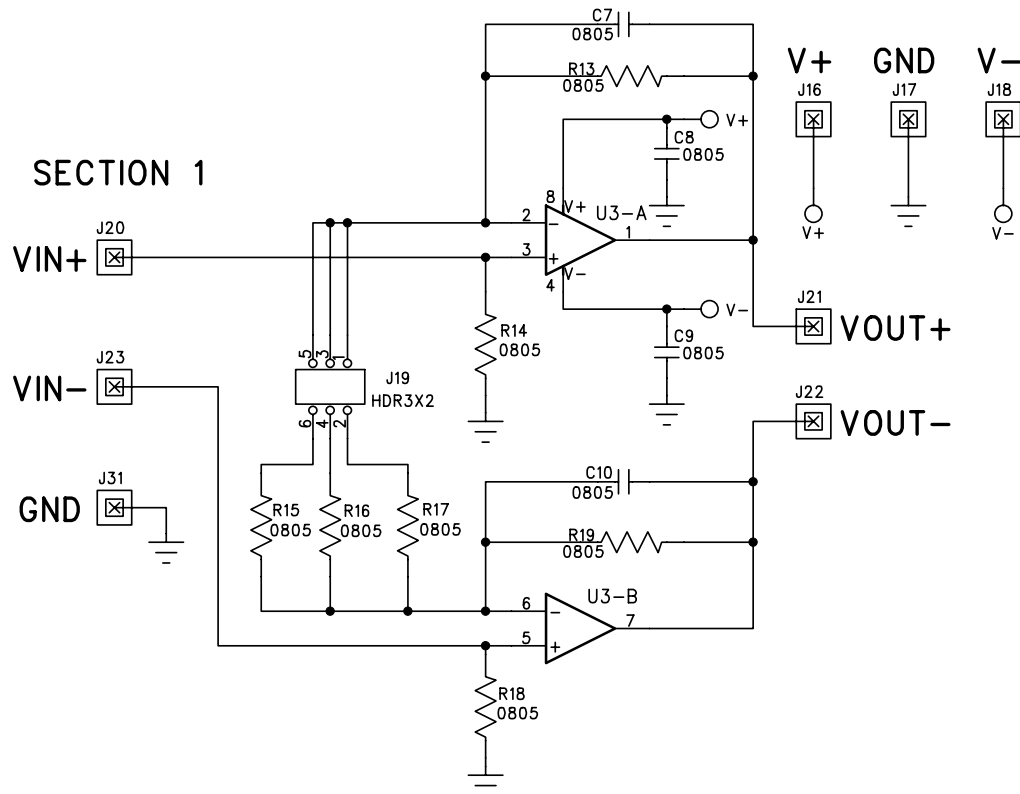


Figure 1. Section 1 Schematic, Differential Input / Differential Output

### 3. CIRCUIT 2 - DIFFERENTIAL INPUT / SINGLE-ENDED OUTPUT

Circuit 2 is a differential amplifier that uses two op-amps. The board accepts a dual amplifier for this function. This circuit accepts a differential input signal, amplifies it, and converts the signal to a ground-referenced, single-ended output signal. Gain is set by the equation,

$$V_{OUT} = \left( (VIN+) - (VIN-) \right) \left( 1 + \frac{R25}{R21} + \frac{2 \cdot R25}{R23} \right)$$

$$R20 = R21$$

$$R22 = R25$$

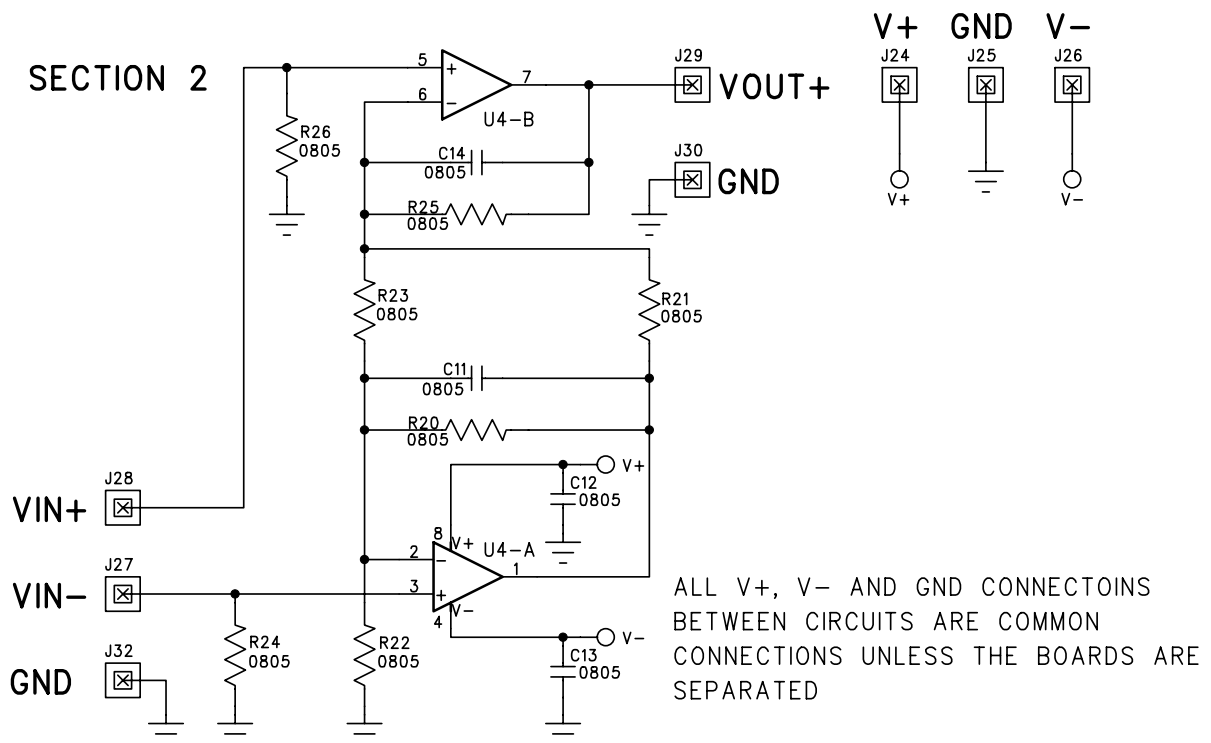
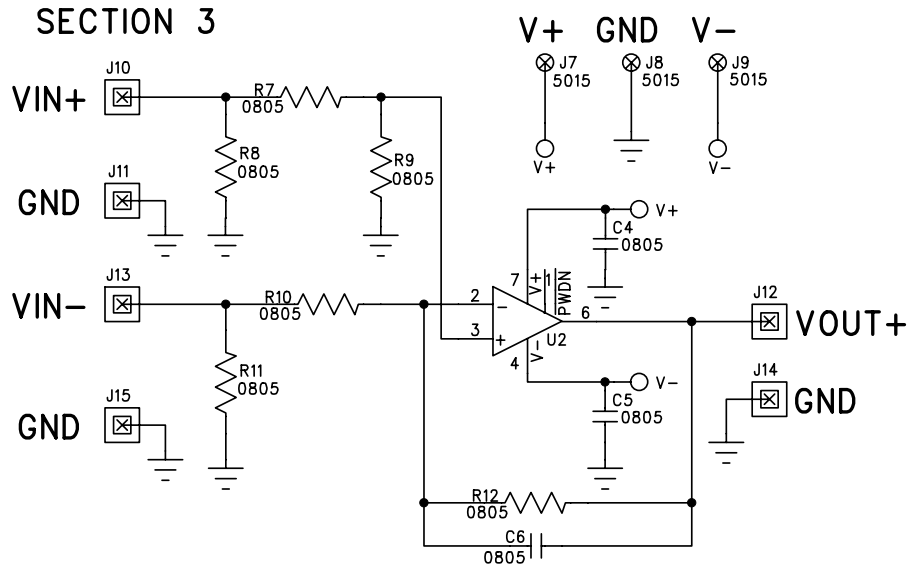


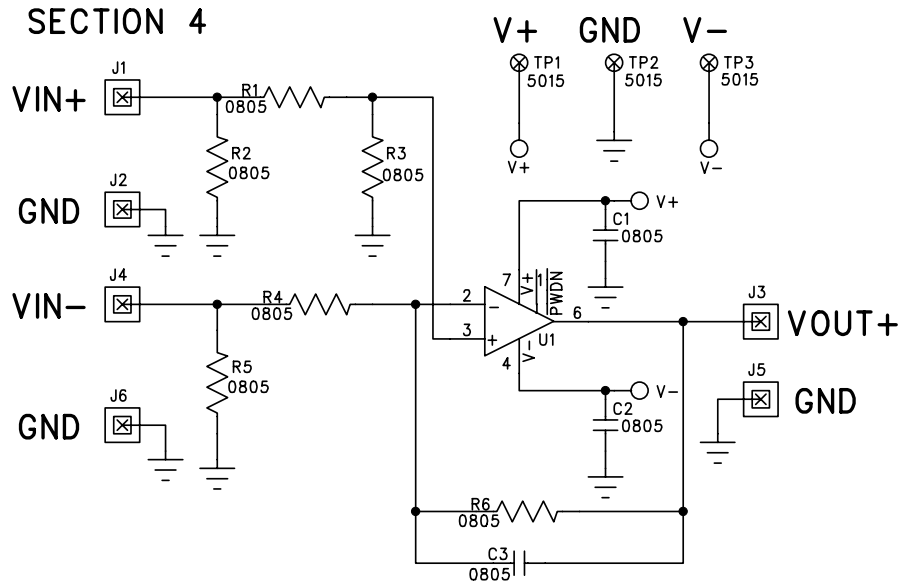
Figure 2. Section 2 Schematic, Dual Op-amp Instrumentation Amplifier

#### 4. CIRCUIT 3 & 4 - INVERTING / NON-INVERTING GAIN

Circuit 3 and Circuit 4 are identical, single-amplifier circuits that, according to component placement, can be configured for either inverting or non-inverting gain. Although the two schematics are identical in function, the circuits do have unique component designators.



**Figure 3. Section 3 Schematic, Inverting or Non-inverting Amplifier**



**Figure 4. Section 4 Schematic, Inverting or Non-inverting Amplifier**



APPENDIX A. PCB LAYER PLOTS

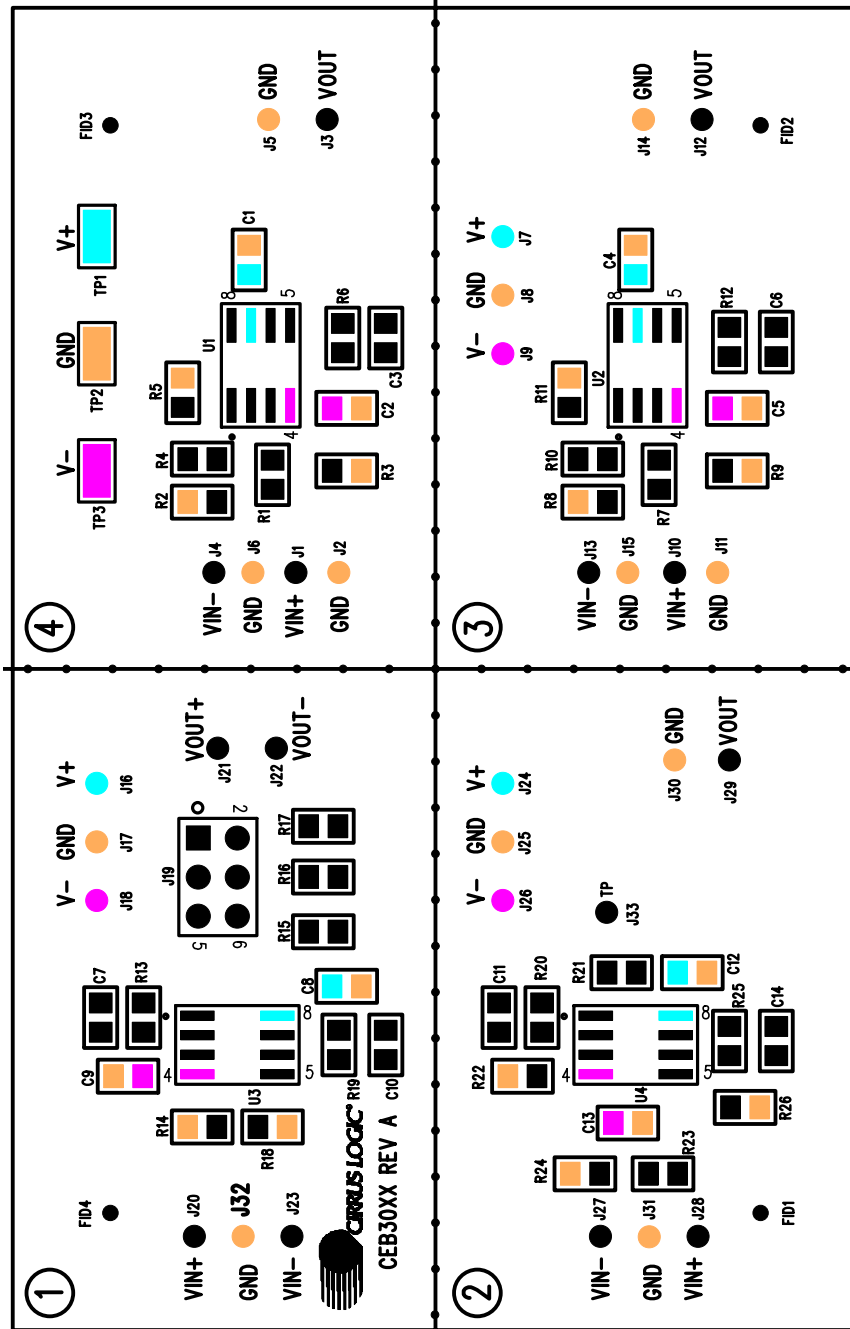


Figure 5. Silkscreen

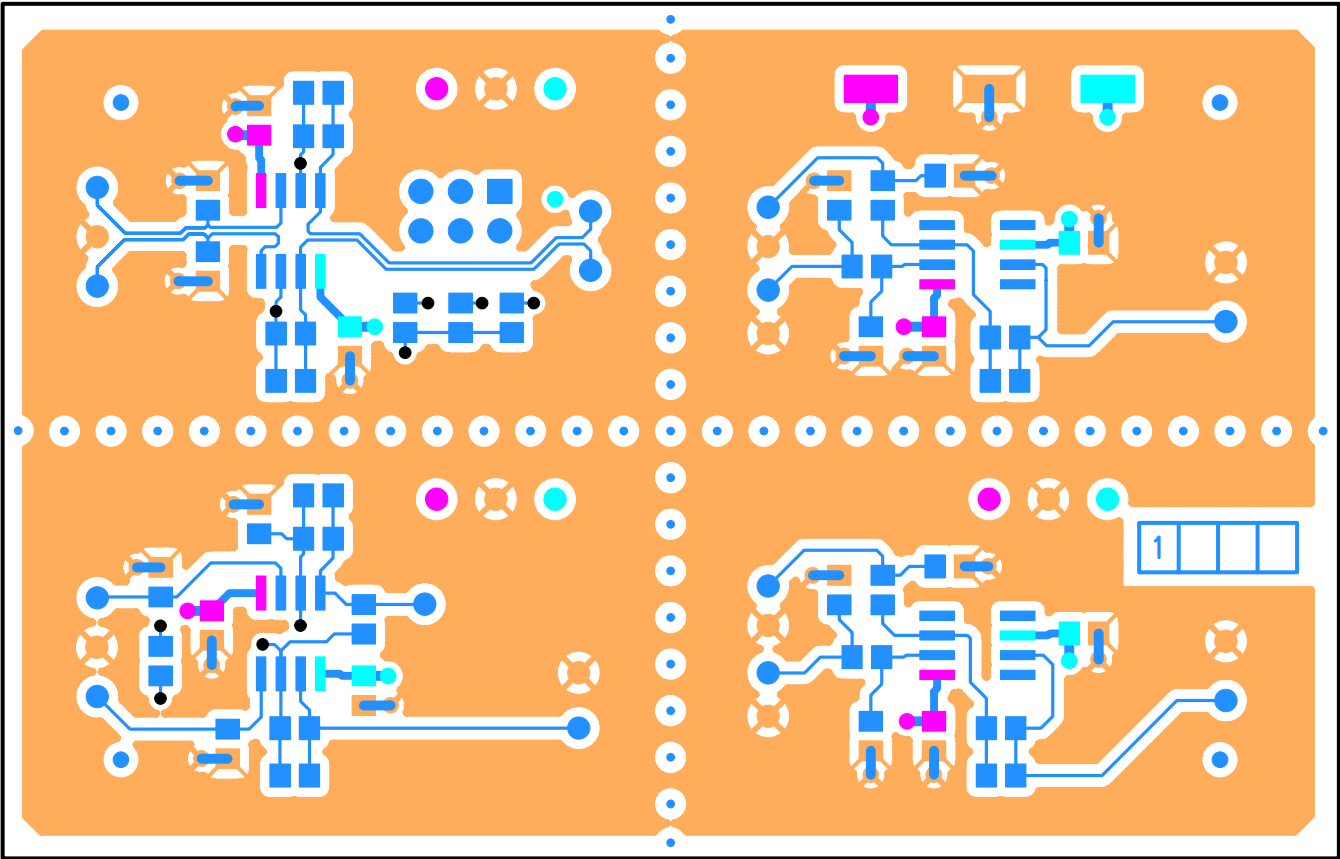


Figure 6. Component Side Routing

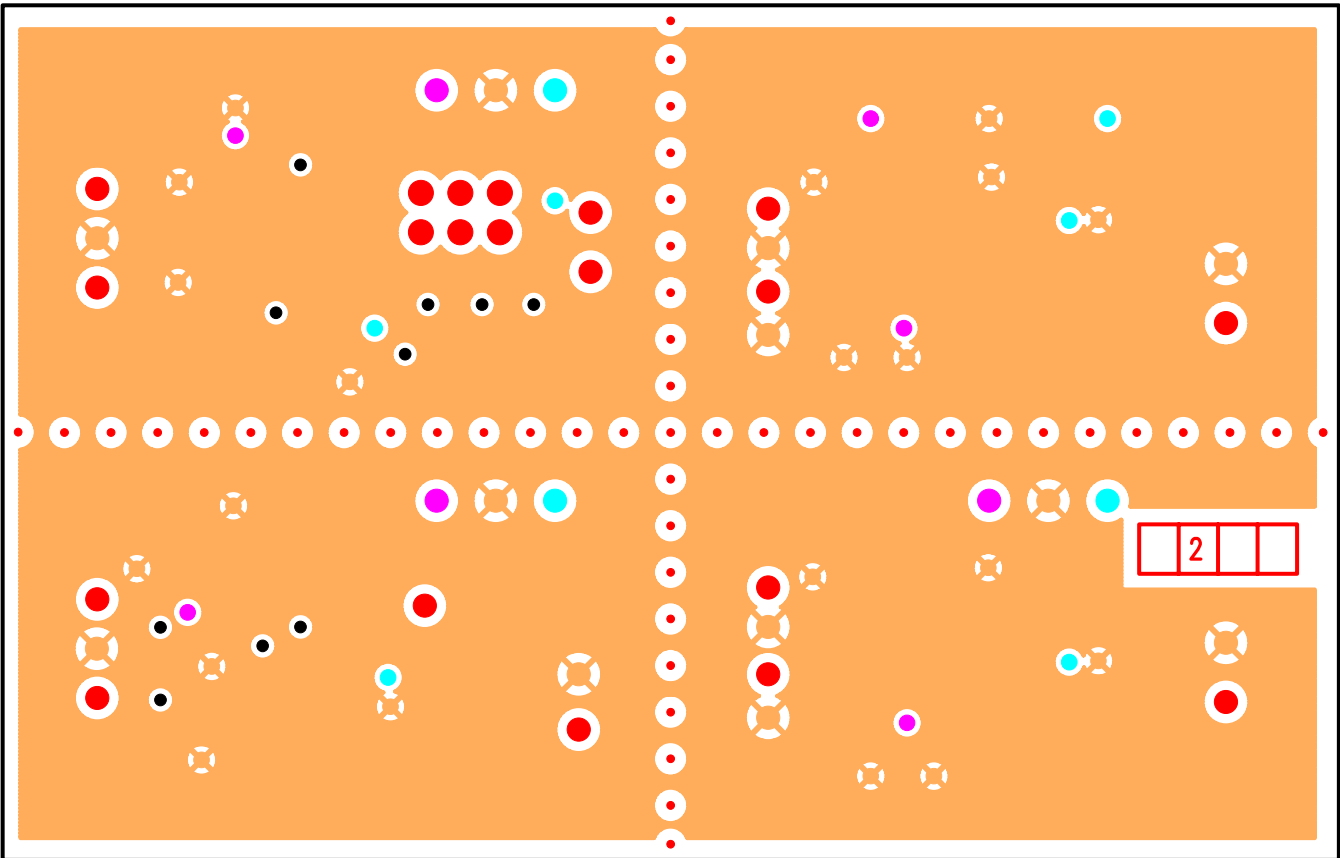


Figure 7. Ground Plane

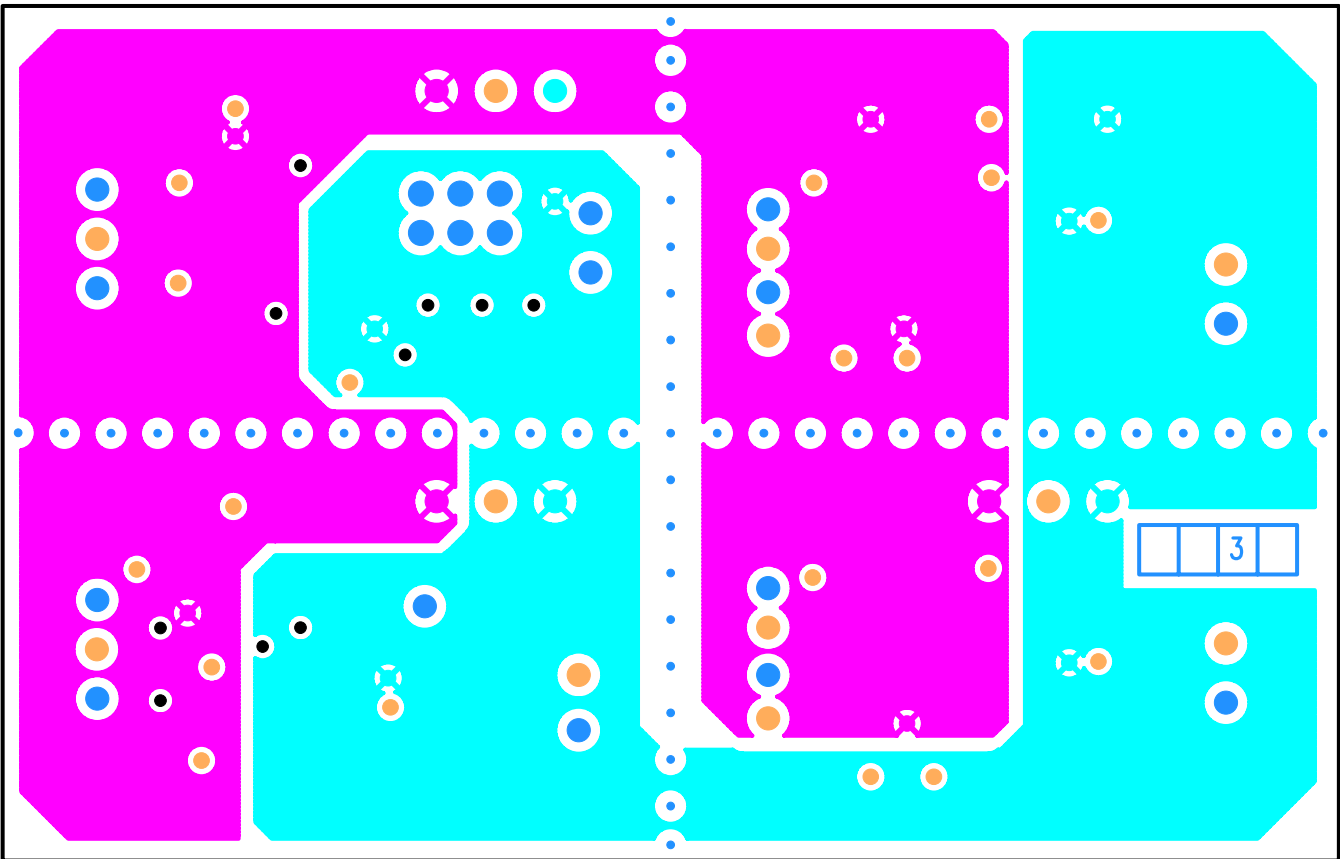


Figure 8. Power Plane

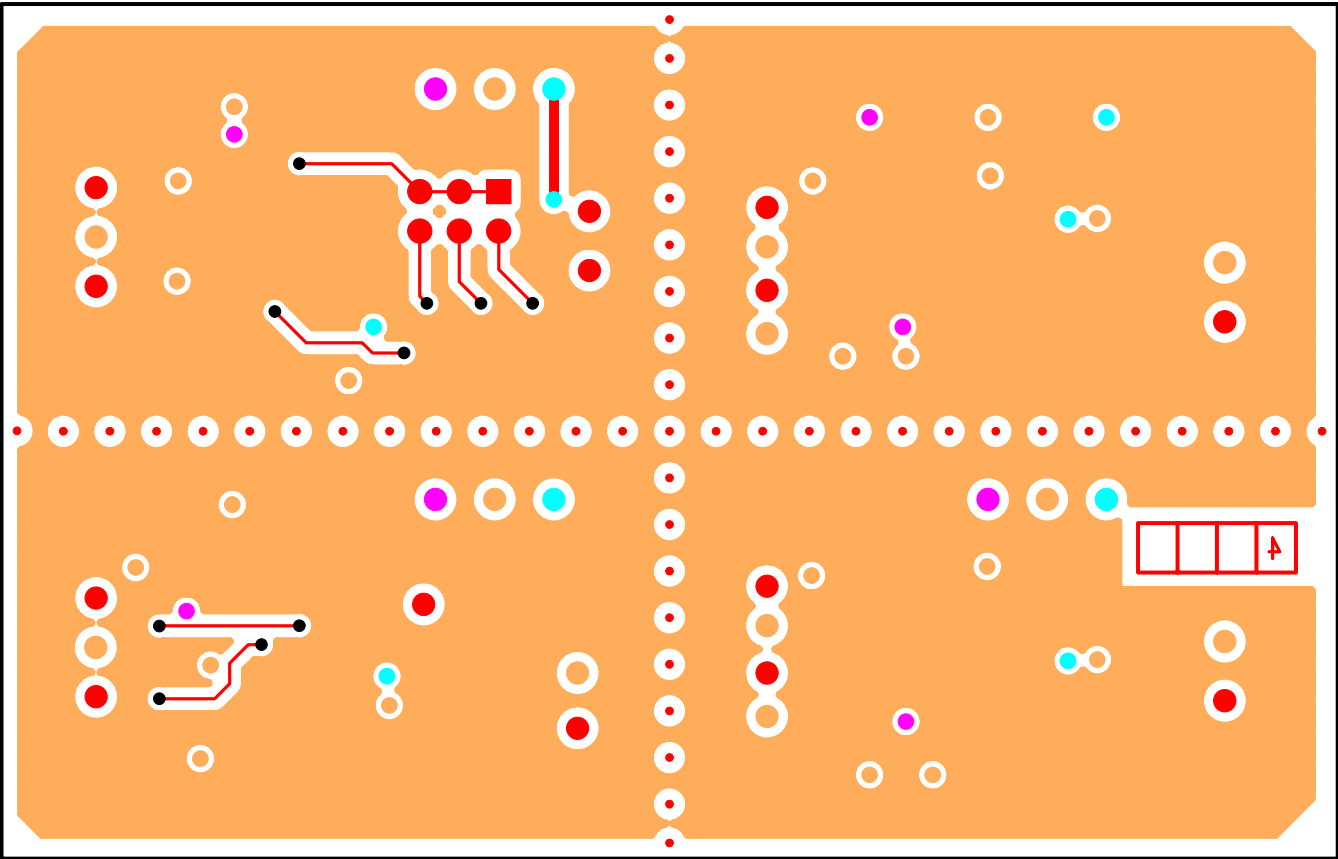


Figure 9. Bottom Side Routing

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**REVISION HISTORY**

Revision	Date	Changes
DB1	JUN 2007	Initial Release.
DB2	JUN 2007	Added photo of board to front page. Changed text to reflect board is shipped with op-amp samples.

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To find the one nearest to you go to [www.cirrus.com](http://www.cirrus.com)

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## NOTES