User's Guide

OPA3S2859RTW Evaluation Module User's Guide

ABSTRACT

This user's guide describes the characteristics, operation, and use of the OPA3S2859RTWEVM. This evaluation module (EVM) is an evaluation and development kit for the OPA3S2859-EP device, a wideband, low-noise programmable gain amplifier with CMOS input for wideband transimpedance and voltage amplifier applications. A circuit description, schematic diagram, layout prints, and bill of materials are included in this document.

Throughout this document, the abbreviation EVM and the term evaluation module are synonymous with the OPA3S2859RTWEVM.

See *Enhanced Product, Dual-Channel, 900-MHz, 2.5-nV/√Hz, Programmable Gain Transimpedance Amplifier* data sheet for more information on the OPA3S2859-EP device.

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Trademarks

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1 Introduction

The OPA3S2859RTWEVM is an evaluation module (EVM) for the OPA3S2859-EP dual-channel, programmable gain transimpedance amplifier. The EVM is shipped as an unpopulated board and will require configuration and component population by the user. The module is designed for general use with 50-Ω impedance test equipment with the ability to configure for different applications.The layout of the board is optimized for performance using 1-kΩ, 10-kΩ, and 100-kΩ resistances in the amplifier feedback paths, providing a wide range of gain options.

1.1 Features

- Configurable for single or split supplies
- Input connection to use integrated feedback switches or connect directly to amplifiers input
- Layout configured to minimize parasitic coupling
- Optional jumpers or RF connectors for control signals

2 Configuration and Usage

The OPA3S2859RTWEVM is ultimately up to the user, but there are several considerations to account for in the proper usage and configuration of the board.

2.1 Power Connections

The EVM features banana jack connections for VCC, VEE, and GND. Connect the positive supply to VCC, the negative supply to VEE, and the ground reference to GND to use the board in split supply configurations. The VEE and GND inputs should be connected to ground for single supply operation. It is important to note that the input and output resistors will be refererenced to the lowest supply voltage instead of a mid-supply voltage as in the split-supply configuration when using the board in a single supply configuration.

It is very important to include the reccomended power supply decoupling capacitors in order to reduce the risk of device oscillations. The smallest valued capacitors should be placed in the footprints closest to the OPA3S2859-EP footprint to provide good high frequency decoupling.

2.2 Power Down, Select, and Latch Connections

The OPA3S2859-EP features control signals to adjust the selected gain paths of each channel (SEL0, SEL1, LTCH_A, and LTCH_B) and power down input to put the device into a low-current mode. The EVM includes the option to use simple jumper configurations to control these signals or SMA connectors for interfacing with test equipment. Each input connections includes a footprint for an optional decoupling capacitor or impedance matching resistor if using a high speed control signal. The jumper configuration simply shorts the respective control line to VCC or VEE to change the pin function. Please refer to the *Enhanced Product, Dual-Channel, 900-MHz, 2.5-nV/√Hz, Programmable Gain Transimpedance Amplifier* data sheet for exact pin threshold voltages when using an external signal.

2.3 Input and Output Signal Connections

The signal input and outputs on the EVM all provide SMA connectors along with resistors to properly impedance match the connections. The INA+, INB+, INA-, and INB- include footprints for simple resistors to ground that can be used to impedance match the inputs or short the input connection to ground. The outputs feature a series-shunt resistor network configuration to allow for an impedance matched network that presents a higher load value to the amplifier. The suggested default values for the output resistors provides an approximate 200-Ω load to the amplifier while matching a 50-Ω terminated output connection. The COMA and COMB inputs a series resistor input and an shunt input that can be used for a termination resistor or to add capacitance to the input.

2.4 Feedback Network Configurations

The OPA3S2859-EP can be configured as a non-inverting voltage amplifier, inverting voltage amplifier, or transimpedance amplifier. The configuration shown in Figure 2-1 shows the amplifier configured for a non-inverting input with a 1 k-Ω gain resistor on the COM pins and 1 k-Ω, 10 k-Ω, and 100 k-Ω resistor in the feedback network. A shorting stub must be placed on the COM pins SMA connectors to connect the feedback resistor to ground. This yields selectable non-inverting gains of 2 V/V, 11 V/V, and 101 V/V. The gain resistor can be connected through the COM or IN- pins for voltage gain configurations, but it is suggested to connect it through the COM pins for the best performance. The series resistors on the COM pins should be shorted and the current input connected through the respective COM pin input for transimpedance configurations. The EVM layout is optimized for voltage gain configurations to easily connect to the test equipment. It is best to build a new board design that locates the diode as close as possible to the COM input for transimpedance tests with a photodiode.

2.5 Important Layout Considerations

The feedback network on the OPA3S2859RTWEVM has been optimized to minize capacitive coupling between the feedback traces when typically using feedback resistors of 1 k-Ω, 10 k-Ω, and 100 k-Ω. This was done by spacing the feedback network and pouring ground between the traces to isolate the capactive coupling. The tradeoff to this optimization is that it can make the amplifier unstable for low gain or attenuator configurations. For applications that have lower gain, the feedback network area can be reduced to minimize the trace inductance and capacitance to ground, which will help stability at low gains. The EVM includes footprints for suggested 10-Ω isolation resistors between the feedback trace and output pin to help isolate some of the added inductance and capacitance from the feedback area.

The board layout also includes an optional pad to connect a resistor between the IN- pins and the feedback network trace by using the existing footprin for R9 or R16. This allows the user to add an optional fourth feedback path in parallel with the existing three feedback connections.

2.6 Schematic

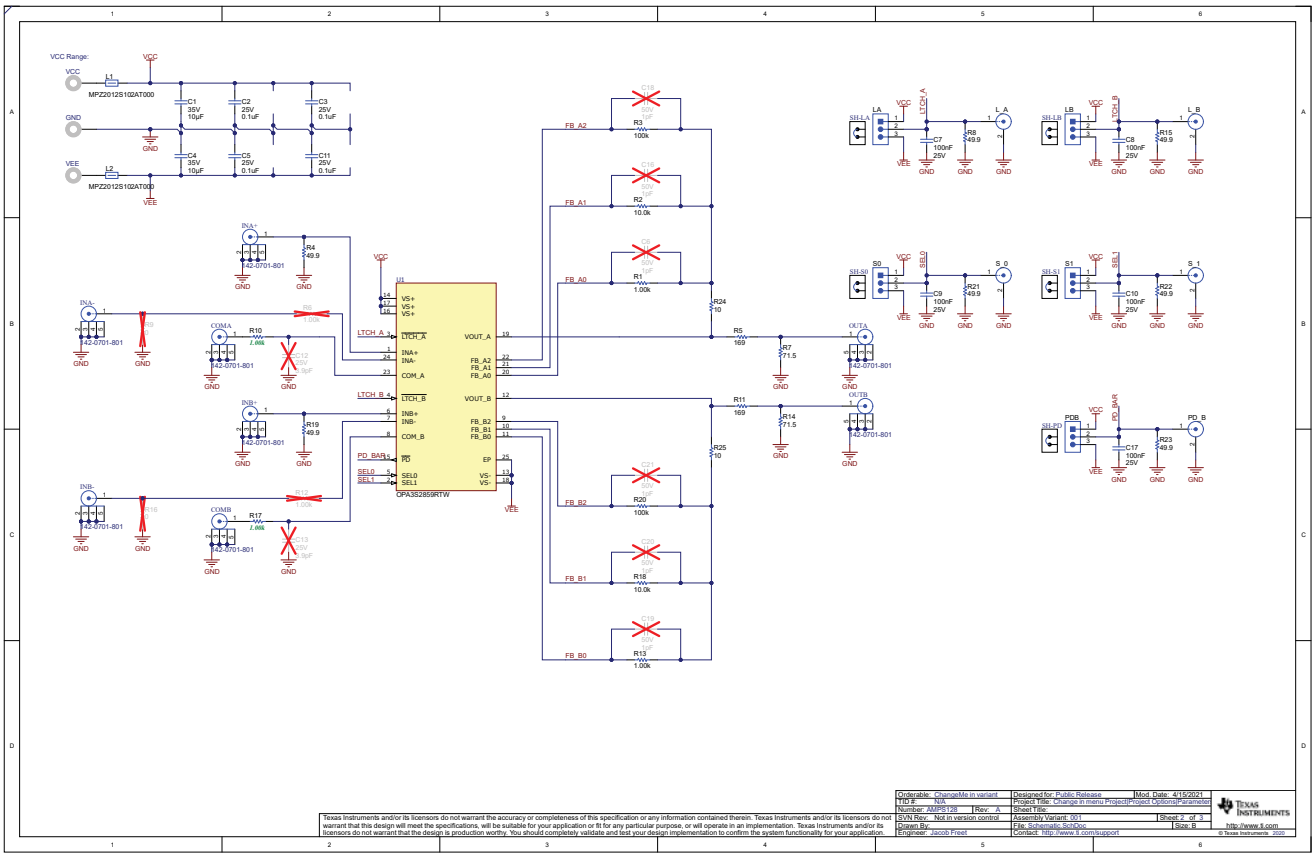

Figure 2-1. OPA3S2859RTWEVM Schematic

2.7 Layout Prints

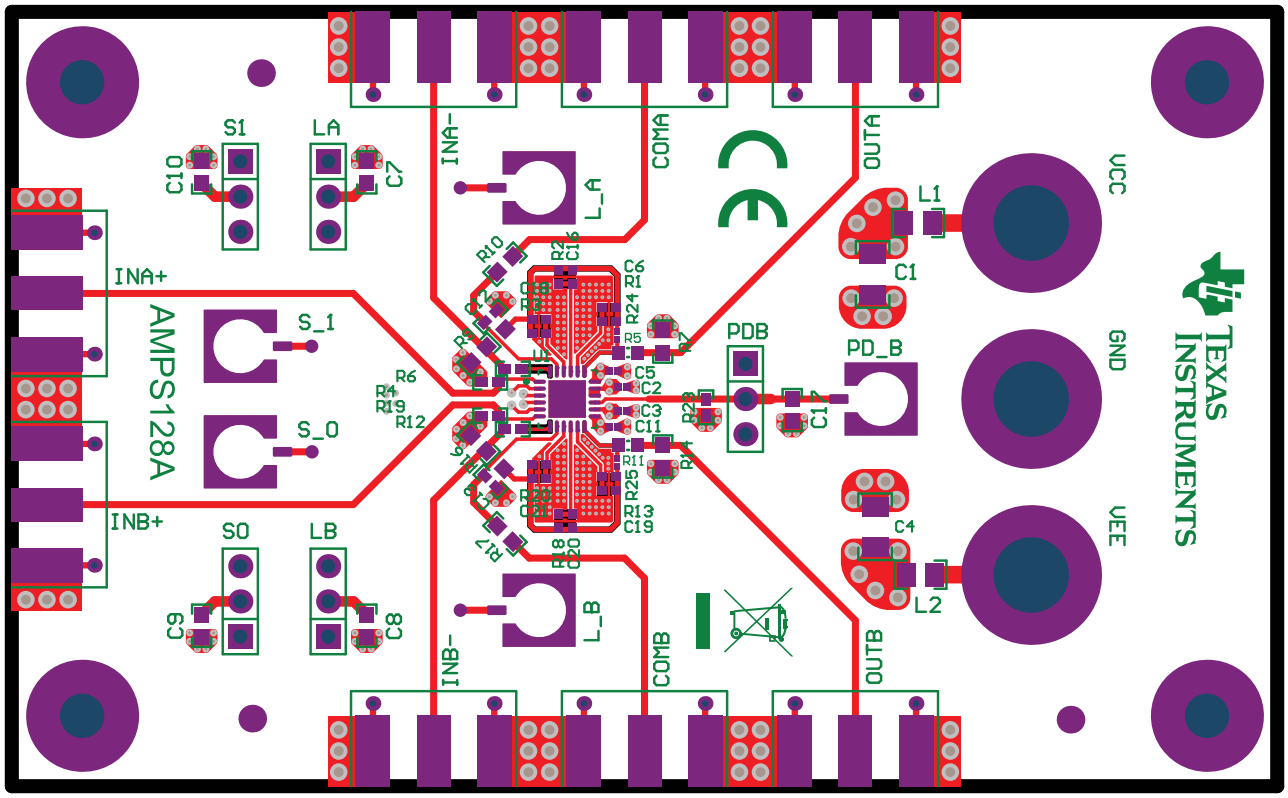

Figure 2-2. Top Layers

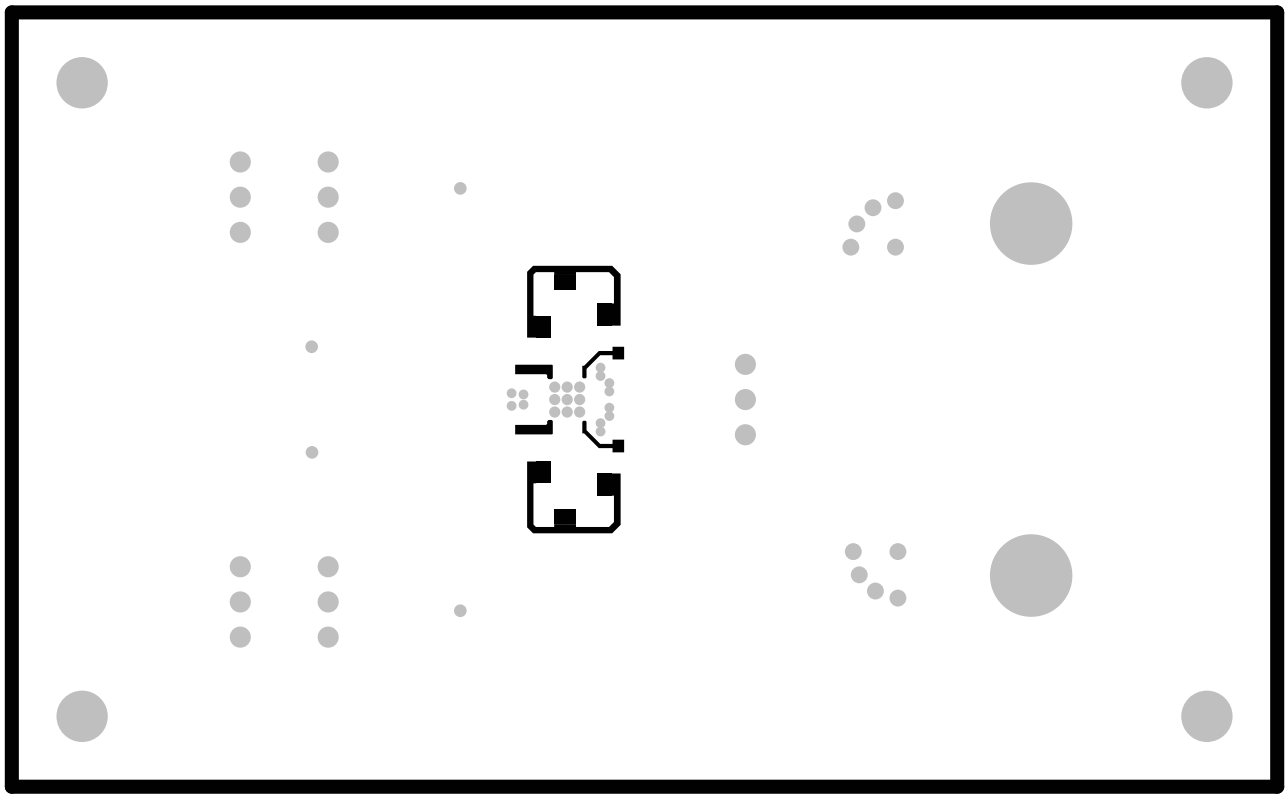

Figure 2-3. Ground Layer

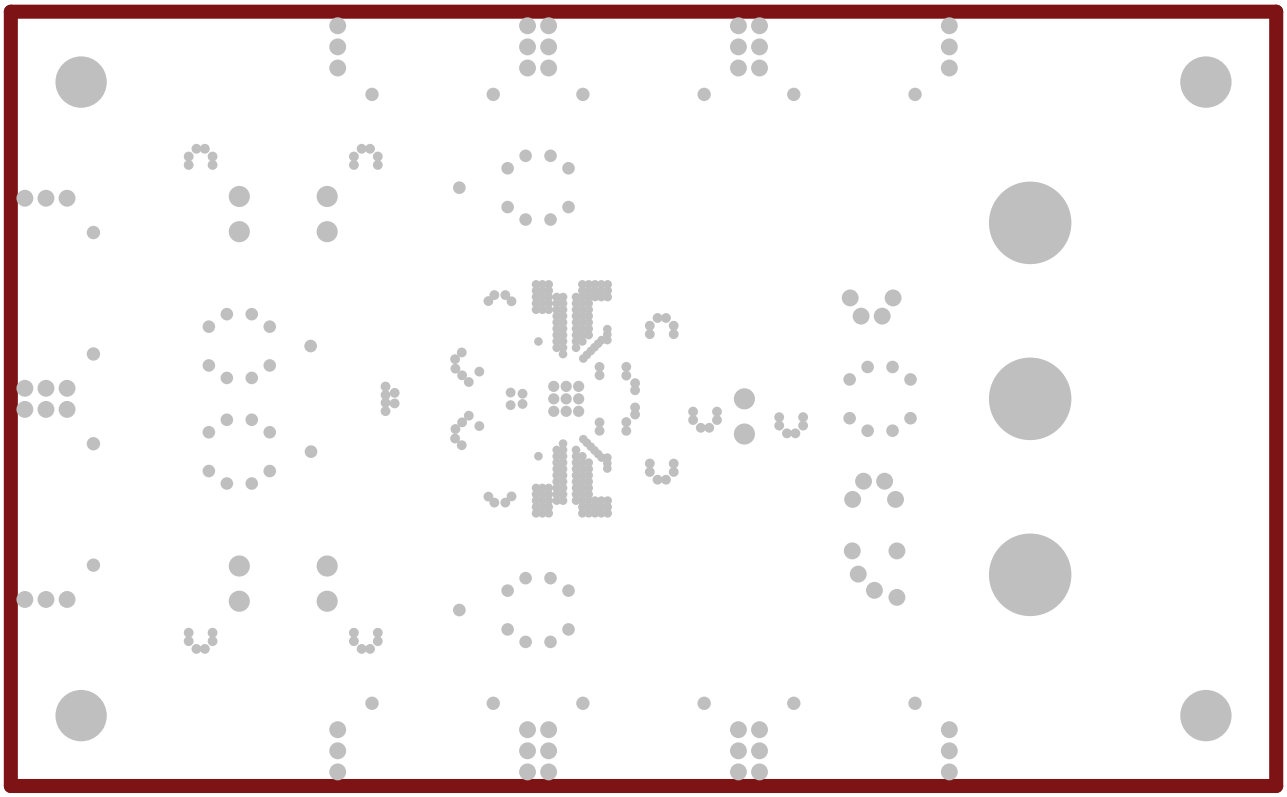

Figure 2-4. VCC Power Layer

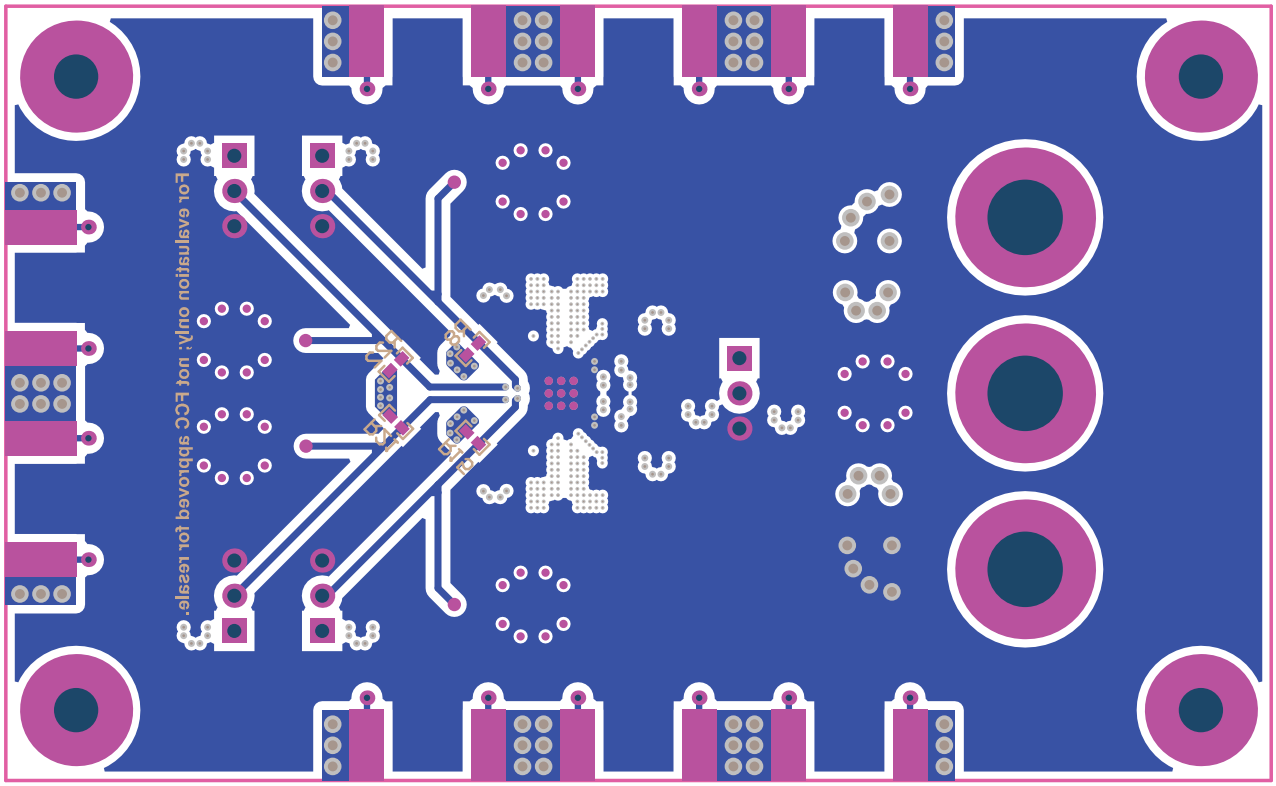

Figure 2-5. Bottom VEE and Signal Layers

3 Related Documentation

1. Texas Instruments, *Enhanced Product, Dual-Channel, 900-MHz, 2.5-nV/√Hz, Programmable Gain Transimpedance Amplifier* data sheet.

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
April 2021	*	Initial Release

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