User's Guide

DEM-OPA-RUN-EVM User's Guide

ABSTRACT

The DEM-OPA-RUN-EVM is a demonstration fixture that helps designers evaluate the operation and performance of TI's high speed, wide bandwidth operational amplifiers. This unpopulated PC board is compatible with dual channel amplifier products offered in the 10-pin QFN (RUN) package. The board is designed to accommodate multiple amplifier configurations to allow for maximum flexibility and ease of use.

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Trademarks

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1 Features

- Configurable for single or split-supply operation
- Includes optional termination resistors on inputs and outputs for easy use with 50-Ω test equipment
- Feedback network components for inverting and non-inverting configurations
- Standard SMA footprints for input and output signal connections
- High speed optimized layout to reduce parasitic effects

2 Power Supply Connections

The DEM-OPA-RUN-EVM is equipped with test point connectors to easily power VCC, VEE, or GND. The positive supply input is labeled Vs+, the negative supply input is labeled Vs-, and the ground is labeled GND.

3 Operating Modes

The DEM-OPA-RUN-EVM can be configured to operate with a single supply voltage or with a split positive and negative supply. Additionally, the EVM can be configured for an inverting or non-inverting circuit with an optional second feedback loop that can include output isolation.

3.1 Single-Supply Operation

To operate the EVM as single supply, connect both the Vs- and GND connectors to ground, and apply the positive-supply voltage to Vs+. In this configuration, a populated output loads (C7, C7, R10, and R21) can present a DC load to ground for the amplifier as they are not referenced to mid-supply in the single-supply configuration. Additionally, the input resistors (R7, R13, R18, and R24) may pull the inputs of the amplifier to ground depending on the configuration. It is important to be aware of any device limitations in the mode of operation.

3.2 Split-Supply Operation

To operate as split supply, apply the positive-supply voltage to Vs+, negative-supply voltage to Vs-, and the ground reference from supply to GND. In this mode the shunt load componenets and input resistors are referenced to the mid-supply potential of ground.

3.3 Amplifier Configurations

The DEM-OPA-RUN-EVM can be configured to have either amplifier channels in inverting or non-inverting configurations as long as the appropriate resistors are populated. Additionally the EVM features a second feedback loop with a resistor and capacitor footprints (R1, R14, C1, and C8) that can be isolated from the output with a series resistor (R8 and R19). This second feedback loop can be used for several purposes. The second loop can be connected purely in parallel with the first loop to add filtering or capacitively coupled second gain resistor. Alternatively the primary feedback loops can be left open (R2 and R15) and the secondary feedback loop can be used to allow for series output resistance within the loop. Typically this is done to add a small amount of resistive isolation to an amplifiers output without affecting the desired output voltage when driving a resistive load.

Figure 5-1 shows the amplifiers in basic non-inverting unity gain configurations with 49.9 Ω series output loads.

4 Input and Output Considerations

The DEM-OPA-RUN-EVM is equipped with footprints for SMA connectors to connect the signal generators and analysis equipment. For best results, the inputs and outputs to the EVM should be terminated to 50-Ω impedances and signals must be routed to and from the EVM with cables having 50-Ω characteristic impedance. For non-inverting configurations INA+ and INB+ (J3 and J6) include termination resistors (R13 and R24), which can be populated with 50-Ω resistors. For inverting configurations, a resistor network (R3, R4, R7, R16, R17, and R18) is included to match the input impedance while maintaining a desired gain resistor value. OUTA and OUTB (J2 and J5) are the output connectors for the amplifiers. Resistor networks (R8, R9, R10, R19, R20, and R21) at the output of the amplifiers can be used to convert the signal to 50-Ω single-ended source while providing a larger total load to the amplifiers when terminated with 50-Ω loads. Output capacitors C7 and C9 may also be populated with resistors to allow for additional output configurations.

5 Schematic

Figure 5-1 shows an example of a non-inverting unity-gain schematic configuration for the DEM-OPA-RUN-EVM.

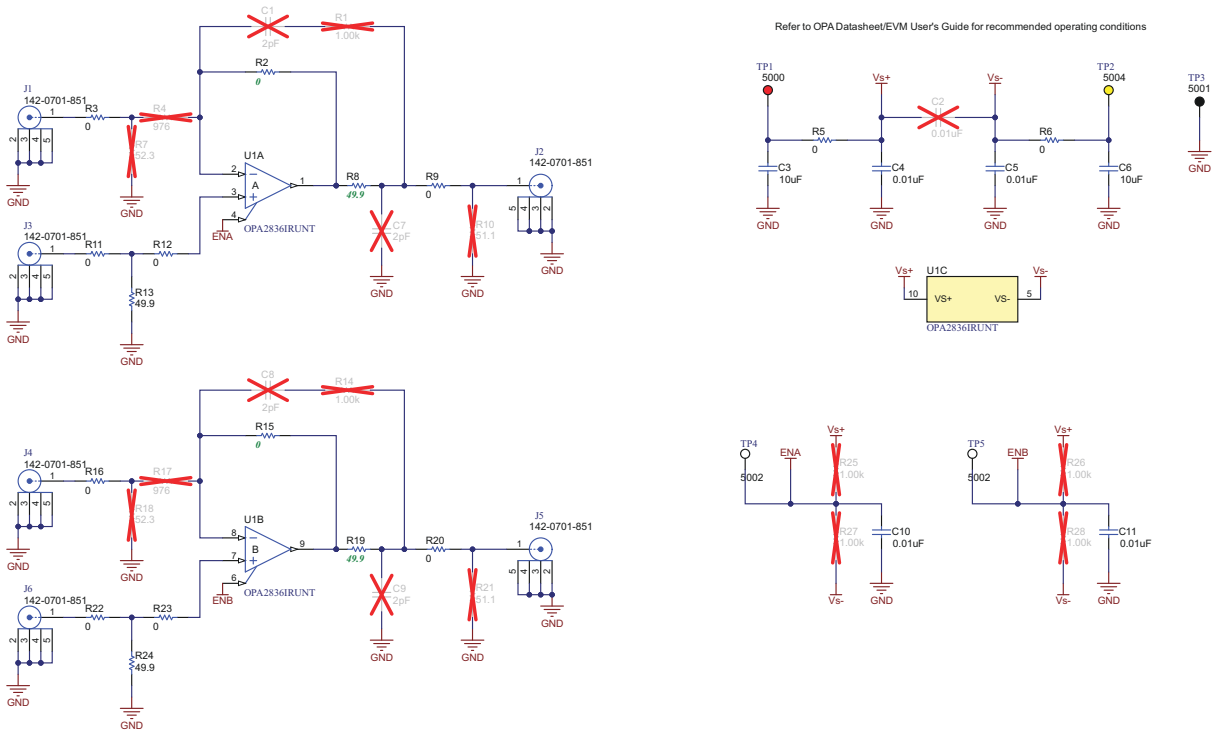

Figure 5-1. Schematic

6 Layout

Figure 6-1 through Figure 6-4 show the PCB layers of the DRM-OPA-RUN-EVM board.

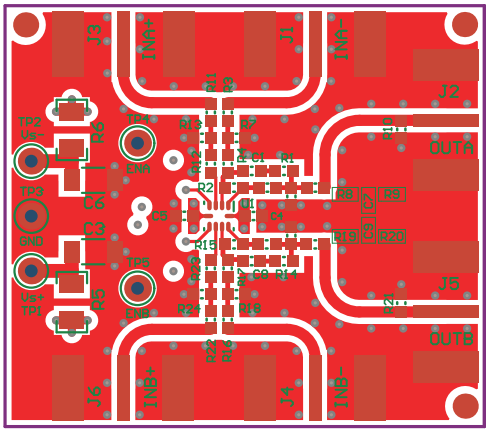

Figure 6-1. PCB Top Layers

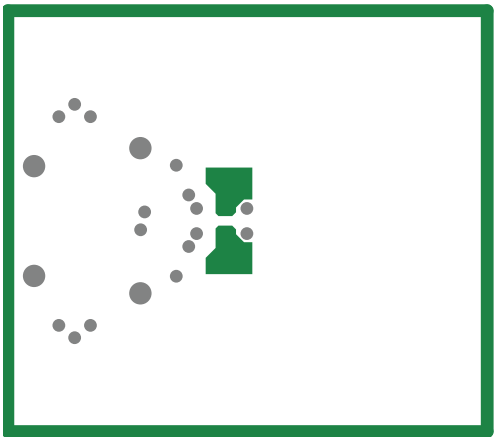

Figure 6-2. PCB Ground Layer

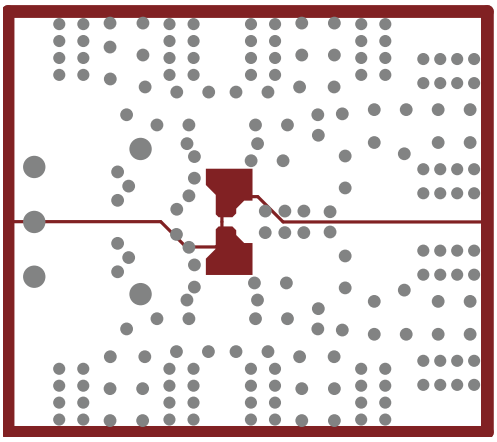

Figure 6-3. PCB Power Layer

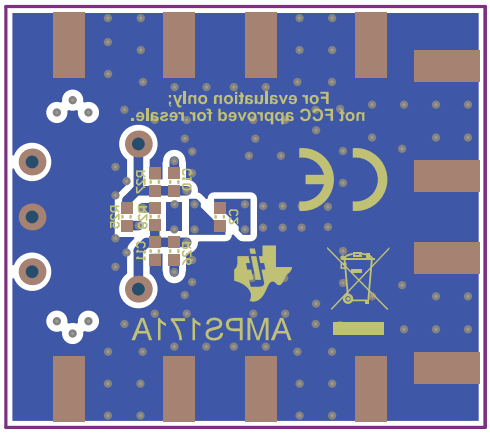

Figure 6-4. PCB Bottom Layers

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CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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