User's Guide

DEM-OPA-DTK-EVM User's Guide

ABSTRACT

The DEM-OPA-DTK-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 single channel amplifier products offered in the 8-pin SON (DTK and DRG) packages. The board is designed to accommodate multiple amplifier configurations to allow for maximum flexibility and ease of use.

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Trademarks

All trademarks are the property of their respective owners.

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 Connections

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

3 Operating Modes

3.1 Single-Supply Operation

To operate as single supply, connect both the VEE and GND connector to ground and apply the positive-supply voltage to VCC. In this configuration, a populated R7 resistor can present a static DC load to ground for the amplifier as it is not referenced to mid-supply in the single-supply configuration. Additionally, the input resistors R6 and R9 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 Configuration

To operate as split supply, apply the positive-supply voltage to VCC, negative-supply voltage to VEE, and the ground reference from supply to GND. In this mode the load resistor R7 and input resistors R6 and R9 are referenced to the mid-supply potential of ground.

4 Input and Output Configurations

The DEM-OPA-DTK-EVM is equipped with footprints for SMA connectors for connection of signal generators and analysis equipment. For best results, the input and output 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. IN+ (J5) includes termination resistor R9 for non-inverting configurations. For inverting configurations an resistor network (R4, R6, and R10) is included to match the input impedance while maintaining a desired gain resistor value. VOUT (J4) is the output connectors for the amplifier. A resistor network (R5, R7, and R11) at the output of the amplifier can be used to convert the signal to 50-Ω single-ended source while providing a larger total load to the amplifier when terminated with 50-Ω load at J4.

Figure 6-1 shows the inputs and output configured in a typical unity-gain amplifier configuration with a single series output load resistor of 49.9-Ω to directly match 50-Ω test equipment.

5 Differences Between DTK and DRG Packages

The DEM-OPA-DTK-EVM board can be used with either of Texas Instruments 8-pin SON packages marked DTK or DRG. By default the board is design with the DTK package footprint, but it is also compatable with the DRG, which has a larger thermal pad than the DTK package. When using either package, the thermal pad solder amount should match the footprint on the board even if using the DRG package with the larger thermal pad footprint. In the case of the DRG package, the solder on the board will simply connect within the bounds of the larger thermal pad located on the device. It is important not to add extra solder to the thermal pad connection when using the DRG package as it could create short circuits under the package between the pins and the thermal pad.

6 Schematic

Figure 6-1 shows an example non-inverting unity-gain schematic configuration for the DEM-OPA-DTK-EVM.

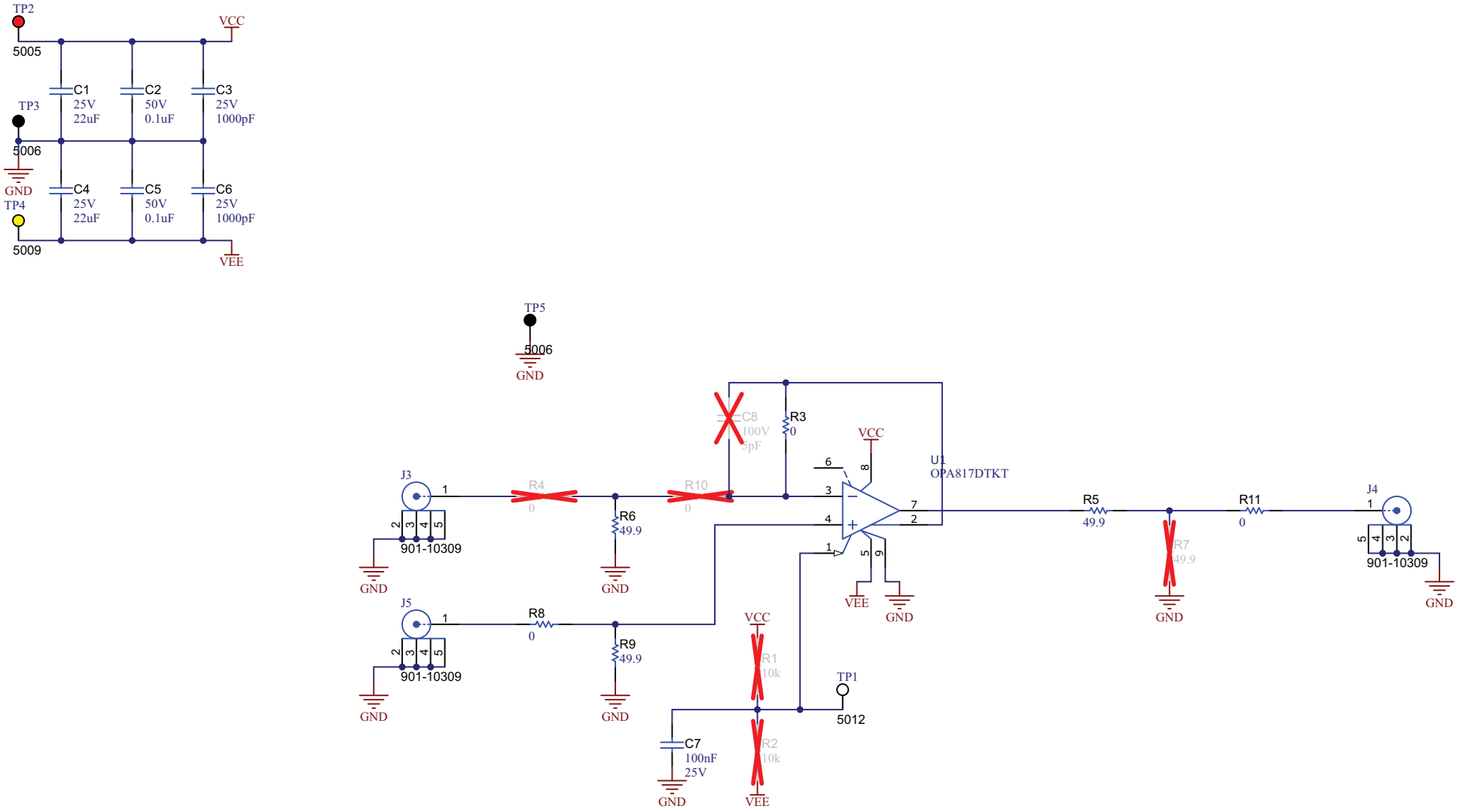

Figure 6-1. Schematic

7 Layout

Figure 7-1 through Figure 7-4 show the PCB layers of the DEM-OPA-DTK-EVM.

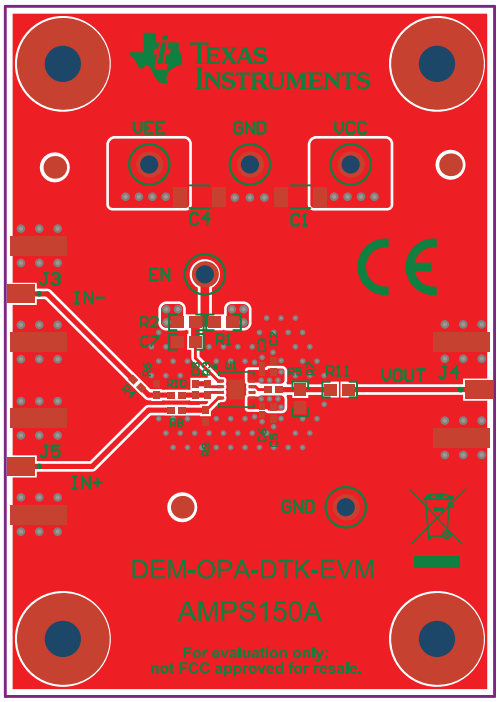

Figure 7-1. Top Layers

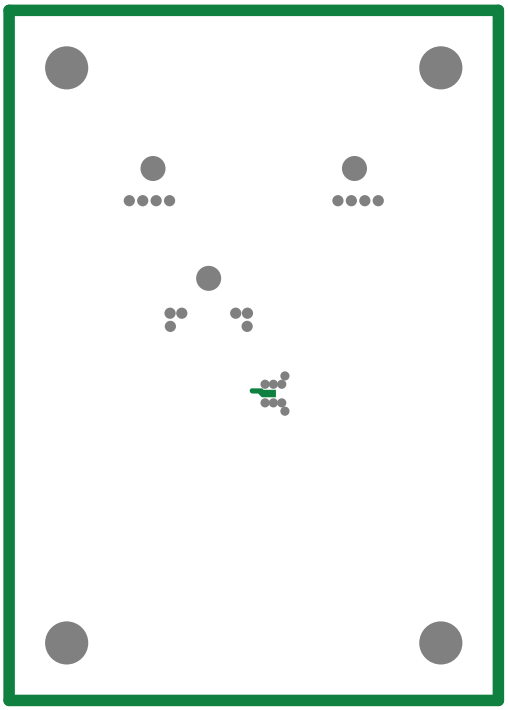

Figure 7-2. Ground Layer

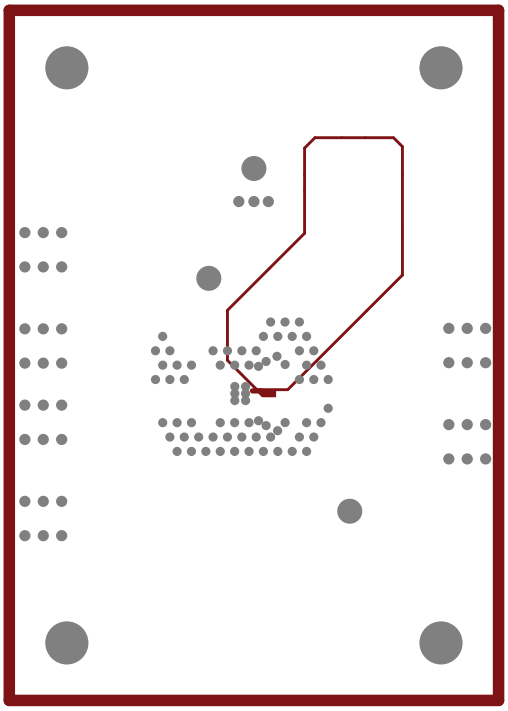

Figure 7-3. Power Layer

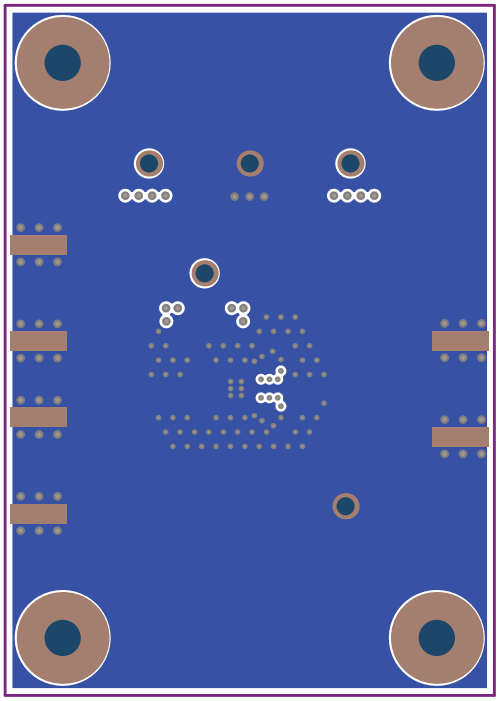

Figure 7-4. Bottom Layers

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NOTE:

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3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

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.

FCC Interference Statement for Class B EVM devices

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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3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
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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