OPA837DBV Evaluation Module

The OPA837DBVEVM is an evaluation module for the single OPA837 amplifier in the DBV (SOT23-6) package. This evaluation module is designed to quickly and easily demonstrate the functionality and versatility of the amplifier. The EVM is ready to connect to power, signal source, and test instruments through the use of onboard connectors. The EVM comes configured for easy connection with common 50-Ω laboratory equipment on its inputs and outputs. The amplifier is configured for single-ended input with non-inverting signal gain of 1 V / V at the device output. The OPA837DBVEVM has a total onboard load of 2 kΩ to the amplifier. The output resistor network converts the output to a 50-Ω impedance source. The evaluation module can be easily configured for other functions, gains, and single-ended or split-supply operation.

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1 Features

This EVM supports the following features:

- Configured for split-supply operation and easily modified for single supply
- Default gain of 1 V/V configuration can be easily reconfigured for other gains
- Designed for easy connection to standard 50-Ω input and output impedance test equipment
- Inputs and outputs include SMA connectors

2 EVM Specifications

Table 1 lists the EVM specifications:

Table 1. EVM Specifications

Parameter		Value
	Single-supply voltage range (V– = ground)	2.7 to 5.4 V
V±	Split-supply voltage range	±1.35 to ±2.7 V
I_S±	Supply current (no load)	612 µA
	Input voltage	V_S±, Max
I_{OUT}	Output drive	±60 mA

3 Power Connections

The OPA837DBVEVM is equipped with test point connectors for easy connection of power. The positive supply input is red and is labeled V+. The negative supply input is yellow and is labeled V–. The ground is black and is labeled GND.

3.1 Split-Supply Operation

To operate as split supply, apply the positive supply voltage to V+, negative supply voltage to V– , and the ground reference from supply to GND.

3.2 Single-Supply Operation

To operate as single supply, connect both the V– connector and the GND connector to ground, and apply the positive supply voltage to V+. Inputs and outputs must be biased as per data-sheet specifications for proper operation.

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4 Input and Output Connections

The OPA837DBVEVM is equipped with SMA connectors for easy connection of signal generators and analysis equipment. As shipped, the EVM is configured for a non-inverting gain of 1 V/V, split-supply operation, single-ended input and output with 50-Ω termination. For best results, signals must be routed to and from the EVM with cables having 50-Ω characteristic impedance. IN+ (J2) should be used for single-ended input with 50-Ω source. OUT (J5) is the output connector. A resistor network (R7, R8, and R9) at the output of the amplifier convert the output signal to 50-Ω single-ended source, and provides a 2-kΩ load to the amplifier when terminated with 50-Ω load at J5. A 50-Ω line-impedance match at OUT (J5) should be preserved. This results in an output measurement loss, and the overall attenuation is approximately 38 dB. See the OPA837 data sheet (SBOS673) applications section, schematics, and layouts for more detail and how to reconfigure the EVM.

5 $\overline{\text{PD}}$ Input Connections

The PD jumper (J4) allows the OPA837 to be disabled. An SMA connector can also be loaded at J3 and a signal for the power down function can be applied for high-speed testing. Normally the J4 jumper is used to enable or disable (power down) the amplifier. When jumper J4 is connected to Vs+ using a shorting block, the amplifier is enabled and when connected to Vs-, the amplifier is disabled. The PD pin should never be left floating.

For high-speed testing, the R12 can be replaced with 50-Ω to terminate the PD SMA input. The shorting block should be removed from J4 during high-speed testing. The 50-Ω at R12 terminates to the ground and not to the supplies. The state of the amplifier will be undefined when the signal source is disconnected. For this reason, 50-Ω at R12 should only be used when driving the SMA connector with a high speed, controlled impedance source.

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6 OPA837DBVEVM Schematic, Layout, and Bill of Materials

6.1 Schematic

Figure 1 illustrates the EVM schematic.

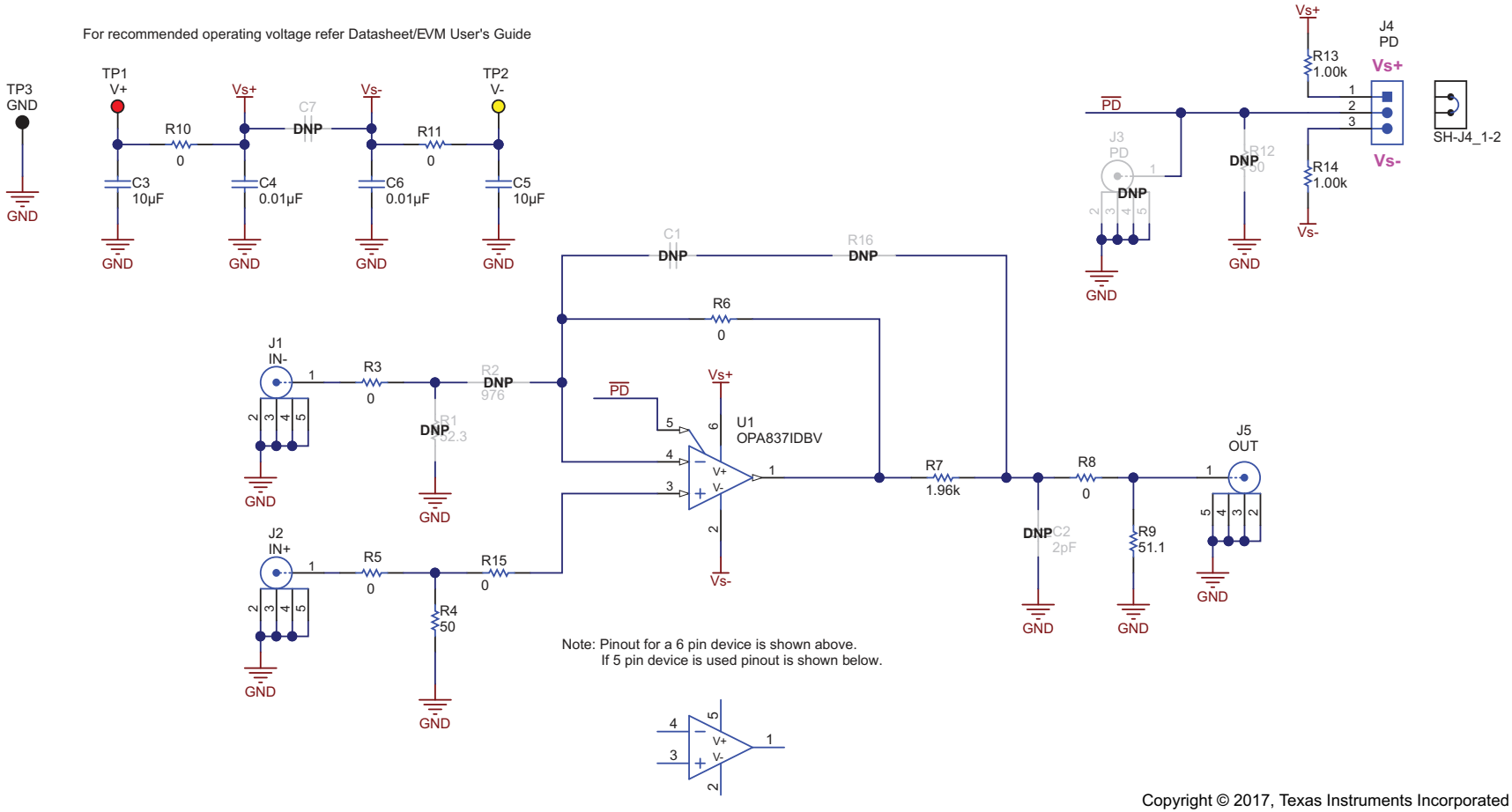

Figure 1. OPA837DBVEVM Schematic

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6.2 OPA837DBVEVM Layers

Figure 2 through Figure 5 show the OPA837DBVEVM layers.

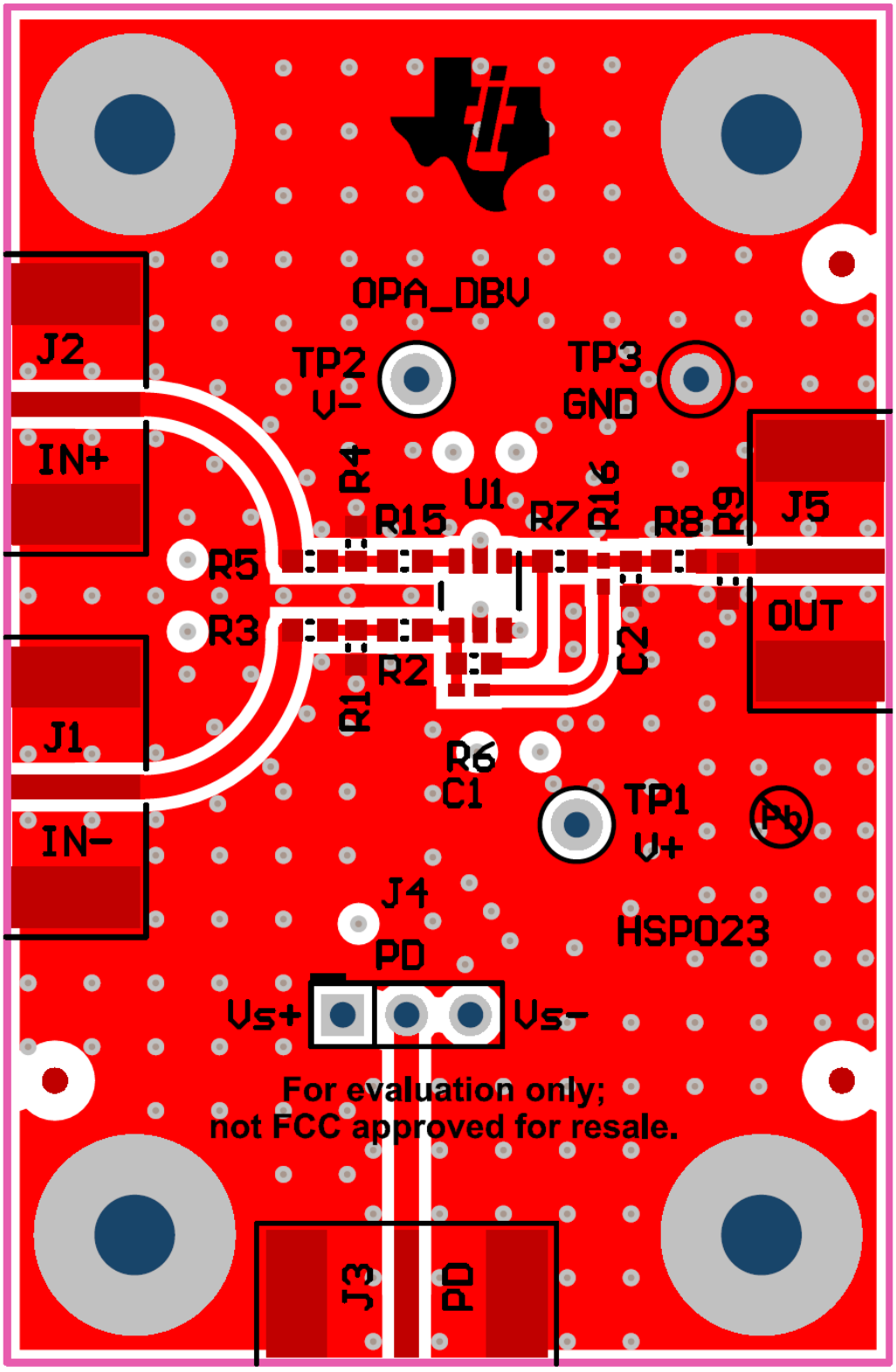

Figure 2. OPA837DBVEVM Top Layer, Signal

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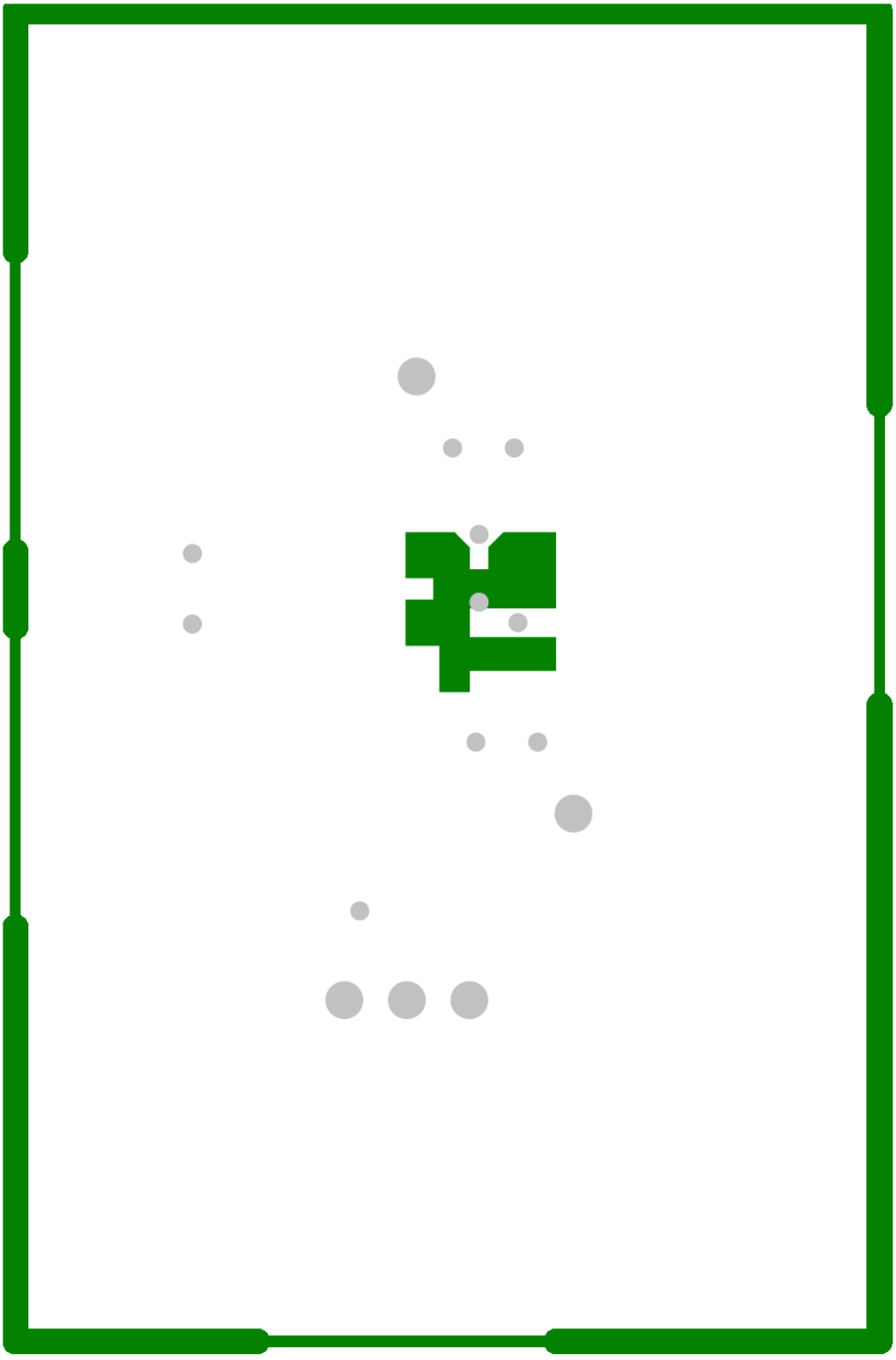

Figure 3. OPA837DBVEVM Layer 2

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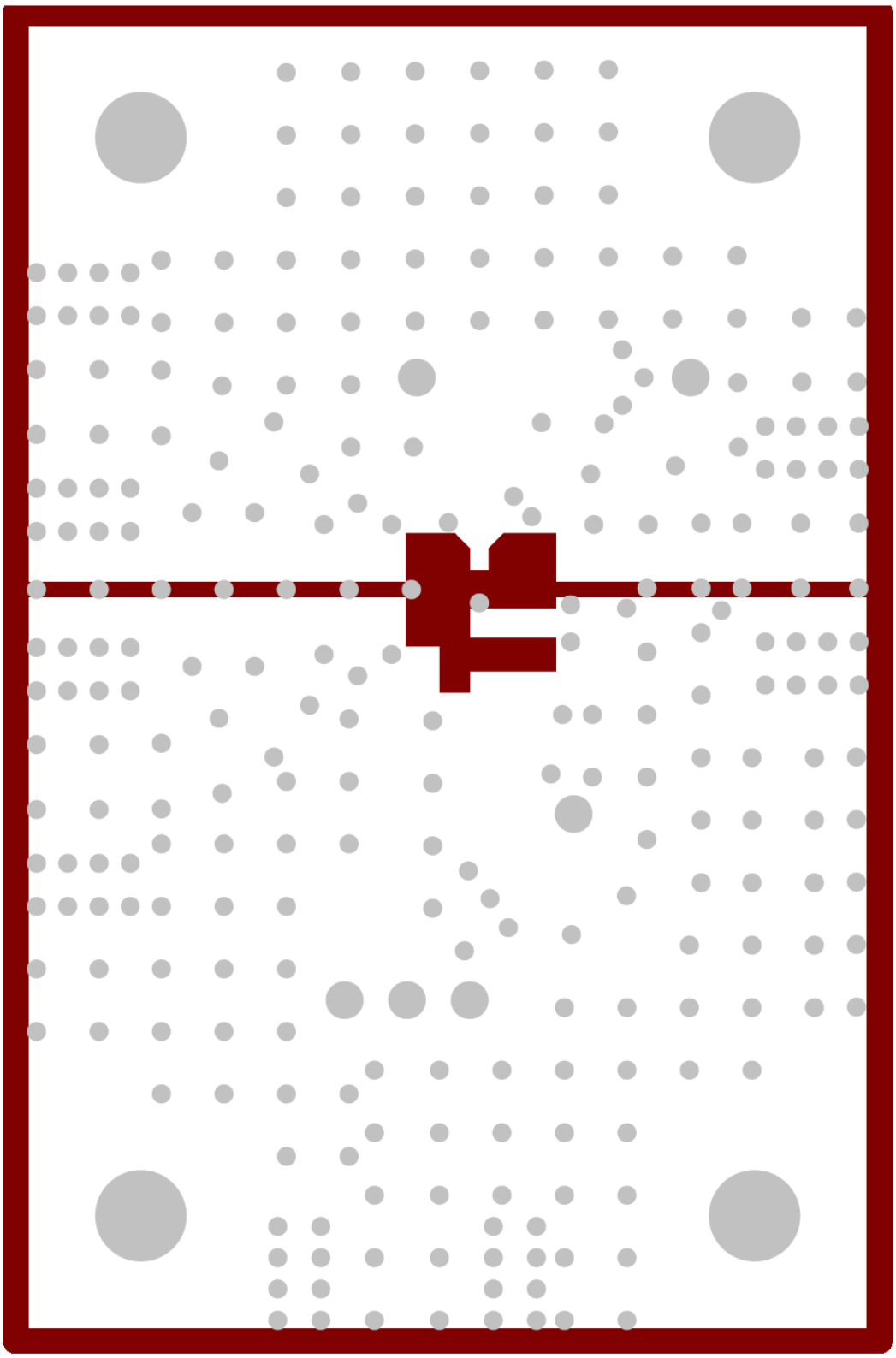

Figure 4. OPA837DBVEVM Layer 3

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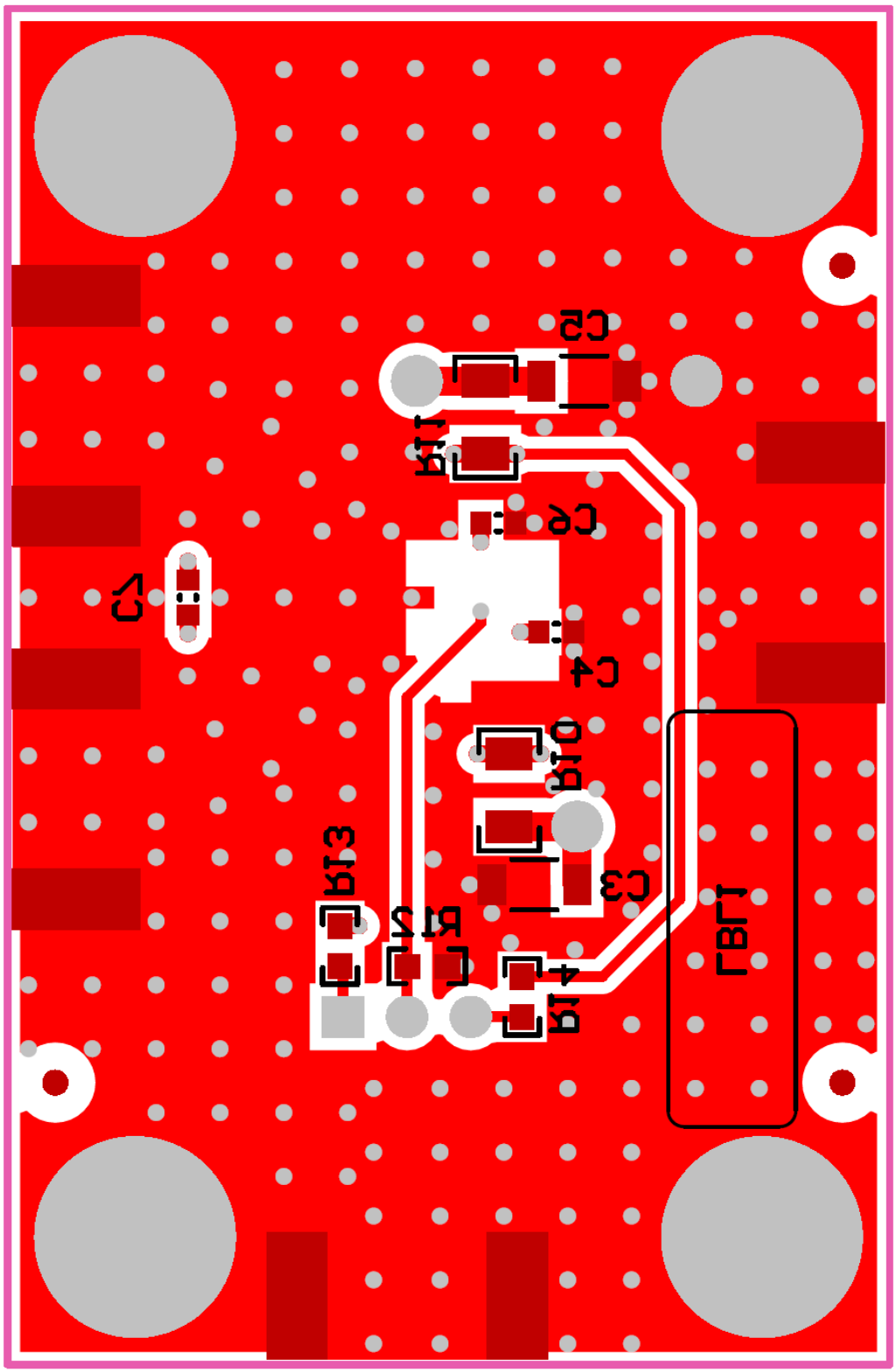

Figure 5. OPA837DBVEVM Bottom Layer

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6.3 Bill of Materials

Table 2 lists the EVM bill of materials.

Table 2. OPA837DBVEVM Bill of Materials

Item	Part Reference	Quantity	Part Number	Manufacturer	Description	Note
1	C3, C5	2	C3216X6S1V106K160AC	TDK	CAP, CERM, 10 µF, 35 V, +/- 10%, X6S, 1206	
2	C4, C6	2	06031C103JAT2A	AVX	CAP, CERM, 0.01 µF, 100 V, +/- 5%, X7R, 0603	
3	J1, J2, J5	3	142-0701-851	Emerson Network Power	Connector, End launch SMA, 50 ohm, SMT	
4	R3, R5, R6, R8, R15	5	CRCW06030000Z0EA	Vishay-Dale	RES, 0, 5%, 0.1 W, 0603	
5	R4	1	CRCW060350R0FKEA	Vishay-Dale	RES, 50, 1%, 0.1 W, 0603	
6	R7	1	CRCW06031K96FKEA	Vishay-Dale	RES, 1.96 k, 1%, 0.1 W, 0603	
7	R9	1	CRCW060351R1FKEA	Vishay-Dale	RES, 51.1, 1%, 0.1 W, 0603	
8	R10, R11	2	RC1206JR-070RL	Yageo America	RES, 0, 5%, 0.25 W, 1206	
9	TP1	1	5000	Keystone	Test Point, Miniature, Red, TH	
10	TP2	1	5004	Keystone	Test Point, Miniature, Yellow, TH	
11	TP3	1	5001	Keystone	Test Point, Miniature, Black, TH	
12	U1	1	OPA837IDBVR	Texas Instruments	Low Power, Precision, 120MHz, Voltage Feedback Op Amp	
13	R13, R14	2	CRCW06031K00FKEA	Vishay-Dale	RES, 1.00 k, 1%, 0.1 W, 0603	
14	J4	1	TSW-103-07-G-S	Samtec	Header, 100mil, 3x1, Gold, TH	
15	SH-J4_1-2	1	382811-6	AMP	Shunt, 100mil, Gold plated, Black	

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   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      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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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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4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

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