THS4551RGTEVM

The THS4551RGTEVM is an evaluation module for the single THS4551 amplifier in the RGT (WQFN-10) 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 or differential input with gain of 1 V/V to differential output at the device pins, which is converted to single-ended via a transformer to the output. It can be easily configured for other functions, gains, and single- or split-supply operation.

The THS4551RGTEVM has an onboard load for the amplifier of 1 kΩ. The output transformer and resistor network converts this to a 50-Ω single-ended output.

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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 configuration is 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

		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)	1.35 mA
	Input voltage	V_S±, Max
I_{OUT}	Output drive	±80 mA

3 Power Connections

The THS4551RGTEVM 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 per data-sheet specifications for proper operation. The THS4551 output common-mode voltage defaults to mid supply if the Vcm connector is left floating.

4 Input and Output Connections

The THS4551RGTEVM is equipped with SMA connectors for easy connection of signal generators and analysis equipment. As shipped, the EVM is configured for a gain of 1, split supply, single-ended or differential input and single-ended output with 50-Ω termination. For best results, signals must be routed to and from the EVM with cables having 50-Ω characteristic impedance. Either IN+ (J2) or IN– (J1) can be used for single-ended input. The unused connector should be terminated with a 50-Ω resistive SMA load. If no SMA load is available the spaces marked C1 or C2 can be loaded with a 0-Ω resistor to terminate the unused input. Use both IN+ (J2) and IN– (J1) for differential input. OUT+ (J8) is the output connector for single-ended output signals. The amplifier converts the single-ended or differential input to a differential signal at its output pins. A resistor network (R8, R9, R10) and transformer on the output of the amplifier convert the differential output signal to single-ended, and provides a 1-kΩ load to the amplifier when terminated in 50 Ω. A 50-Ω line-impedance match at OUT+ should be preserved. This results in an output measurement loss, and the overall gain is approximately –30 dB. See the THS4551 data sheet applications section (SBOS778), schematics, and layouts for more detail and how to reconfigure the EVM.

4.1 VOCM Input Connections

The Vcm input (J3) is optional and the SMA connector is not loaded in default configuration. This input sets the common mode of the output pins. The THS4551 will automatically self-bias the output common-mode voltage to the mid-supply voltage if the Vocm pin is not connected. This is the optimal voltage for maximum output swing and best linearity.

The valid range of the VOCM is 0.55 V above the negative supply to 1.5 V below the positive supply. For example, on a ±2.5-V split supply, the Vocm pin can be set anywhere from –1.95 V to 1.0 V. With a single 5-V supply the valid range would be 0.55 V to 3.5 V. Remember, the outputs of the THS4551 can swing from rail to rail; however, the maximum output swing available is reduced when the VOCM pin is set to a voltage other than mid supply.

If providing 50-Ω termination for the Vcm input signal source is desired, C6 can be replaced with a 0-Ω resistor. The board is shipped with C6 populated with 0.22 µF and VOCM input is set to mid-supply voltage with C6 populated.

4.2 $\overline{PD}$ Input Connections

The PD jumper (J5) allows the THS4551 to be disabled. An SMA connector can also be loaded at J4 and a signal for the power down function can be applied for high-speed testing. Normally the J5 jumper is used to enable or disable (power down) the amplifier. When jumper J5 is open, the amplifier is **not** powered down, so it is enabled. When the shorting block is connected and J5 is closed, the amplifier is powered down.

For high-speed testing, the C4 can be replaced with 0 Ω to terminate the PD SMA input. The shorting block should be removed from J5 during high-speed testing. Because 0 Ω at C4 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, 0 Ω at C4 should only be used when driving the SMA connector with a high speed, controlled impedance source.

4.3 Using the Optional Differential Outputs (J6, J7)

The THS4551RGTEVM can be reconfigured for fully-differential outputs. By removing resistors R19 and R20, the balun circuit is disconnected from the amplifier output. If 50-Ω resistors are loaded in the R26 and R27 resistor positions, and SMA connectors are loaded in the J6 and J7 connector positions, J6 and J7 can be used for fully-differential output signals. If 50-Ω test equipment is connected to J6 and J7, the total load to the amplifier is 200 Ω. The data-sheet specifications were produced with a 1-kΩ load. In order to match a 1-kΩ load, load R26 and R27 with 475-Ω resistors, and then load R25 and R28 with 56.2-Ω resistors.

5 THS4551RGTEVM Schematic, Layout, and Bill of Materials

5.1 Schematic

Figure 1 illustrates the EVM schematic.

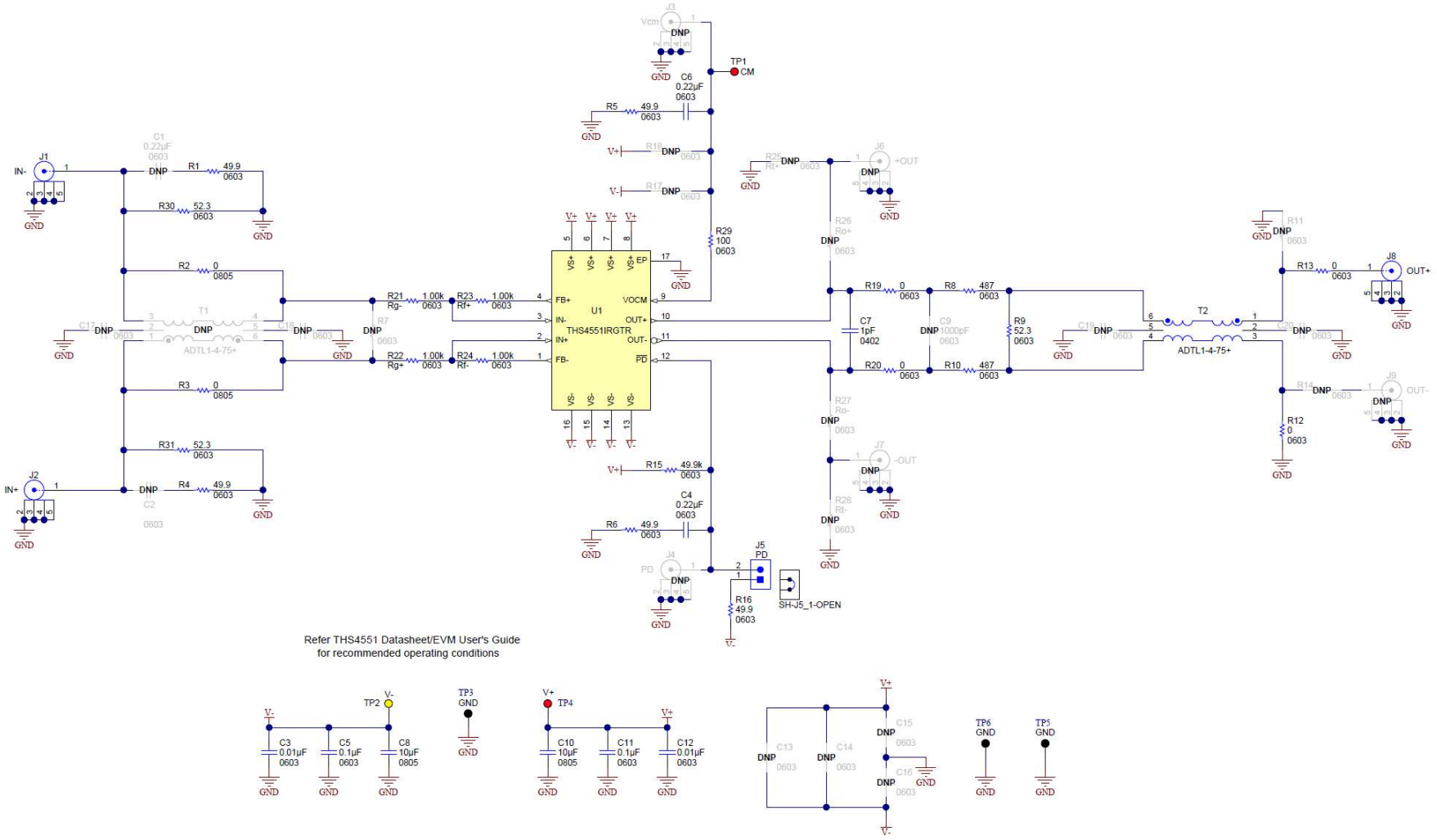

Figure 1. THS4551RGTEVM Schematic

5.2 THS4551RGTEVM Layers

Figure 2 through Figure 5 show the THS4551RGTEVM layers.

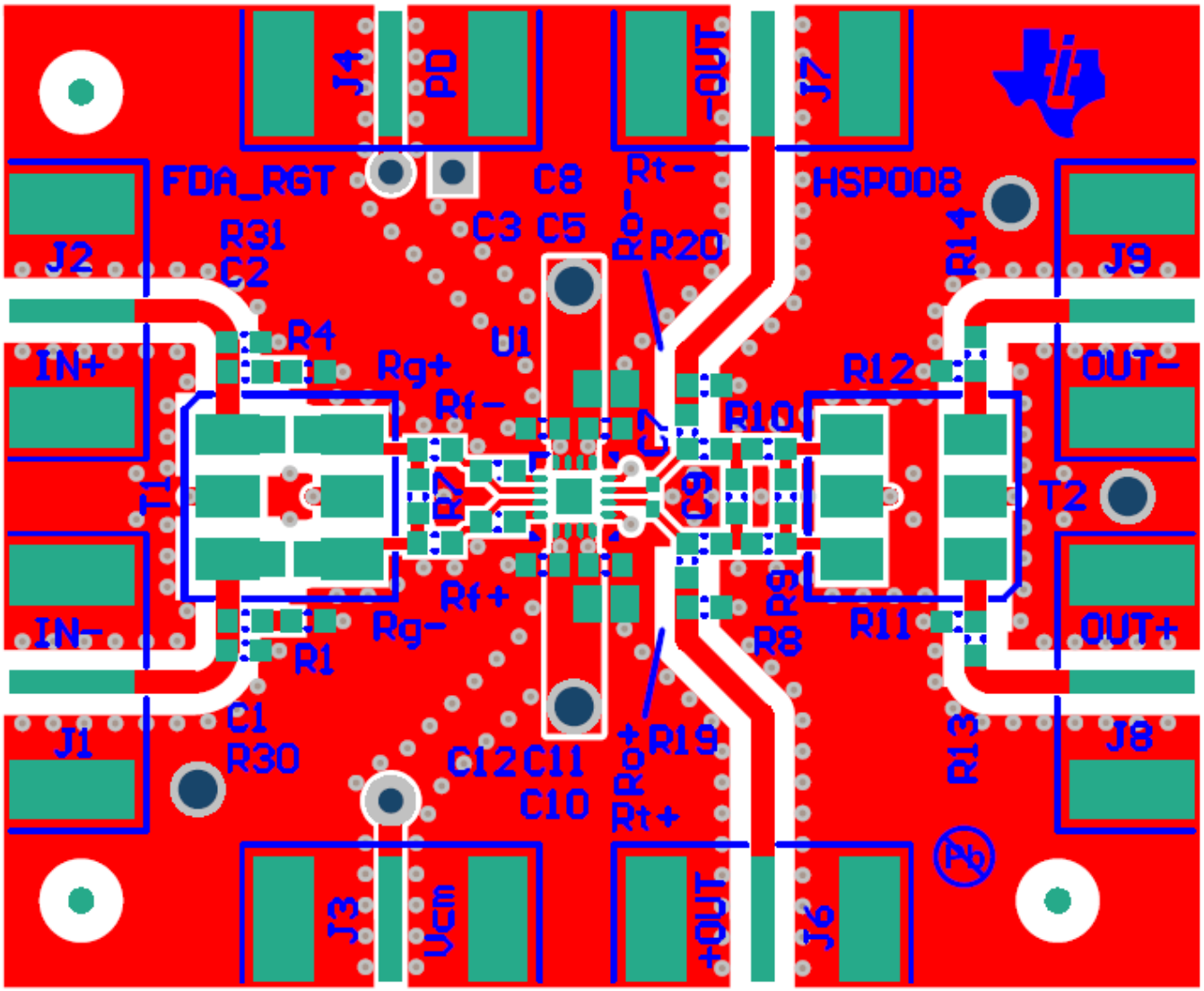

Figure 2. THS4551RGTEVM Top Layer, Signal

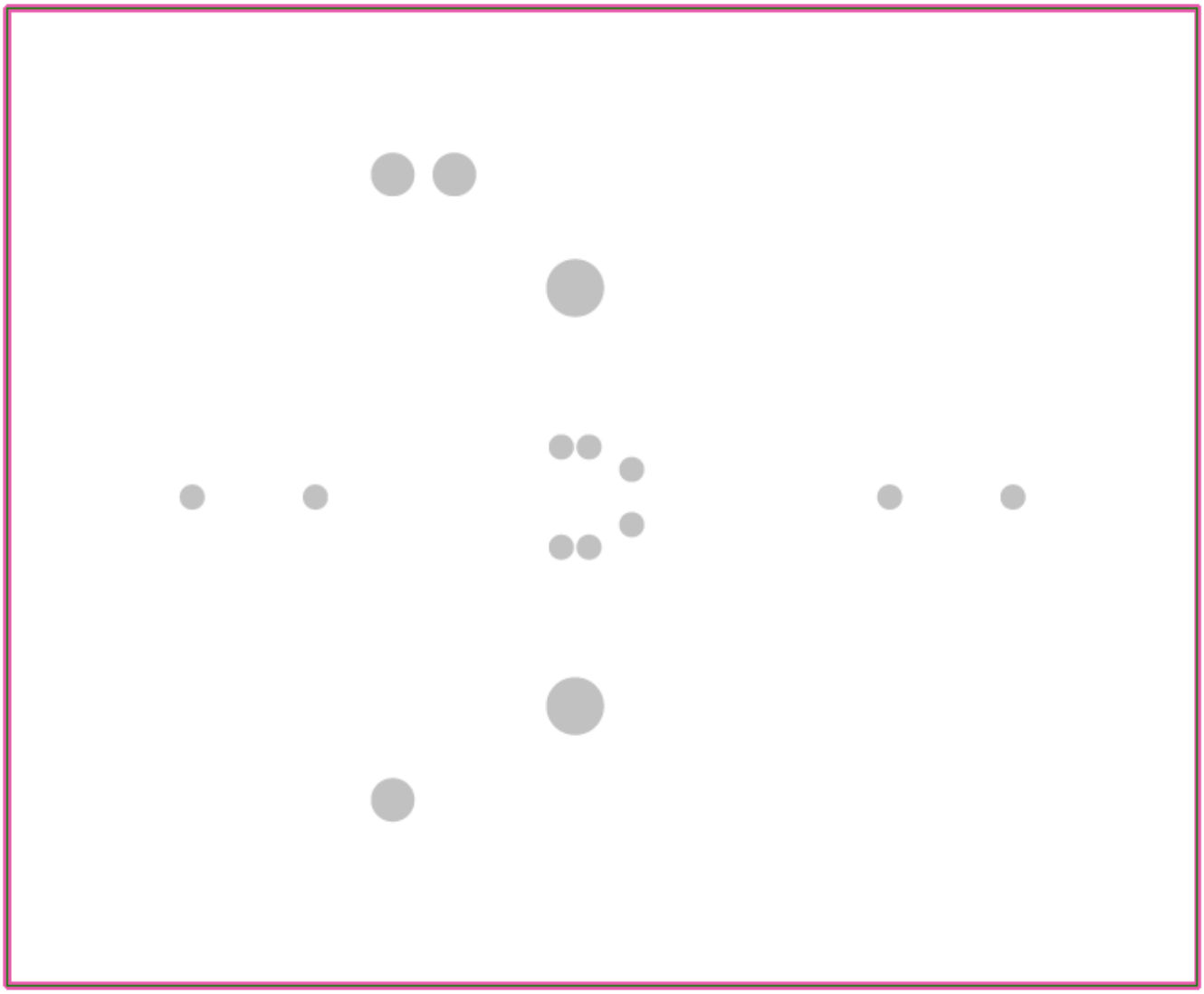

Figure 3. THS4551RGTEVM Layer 2

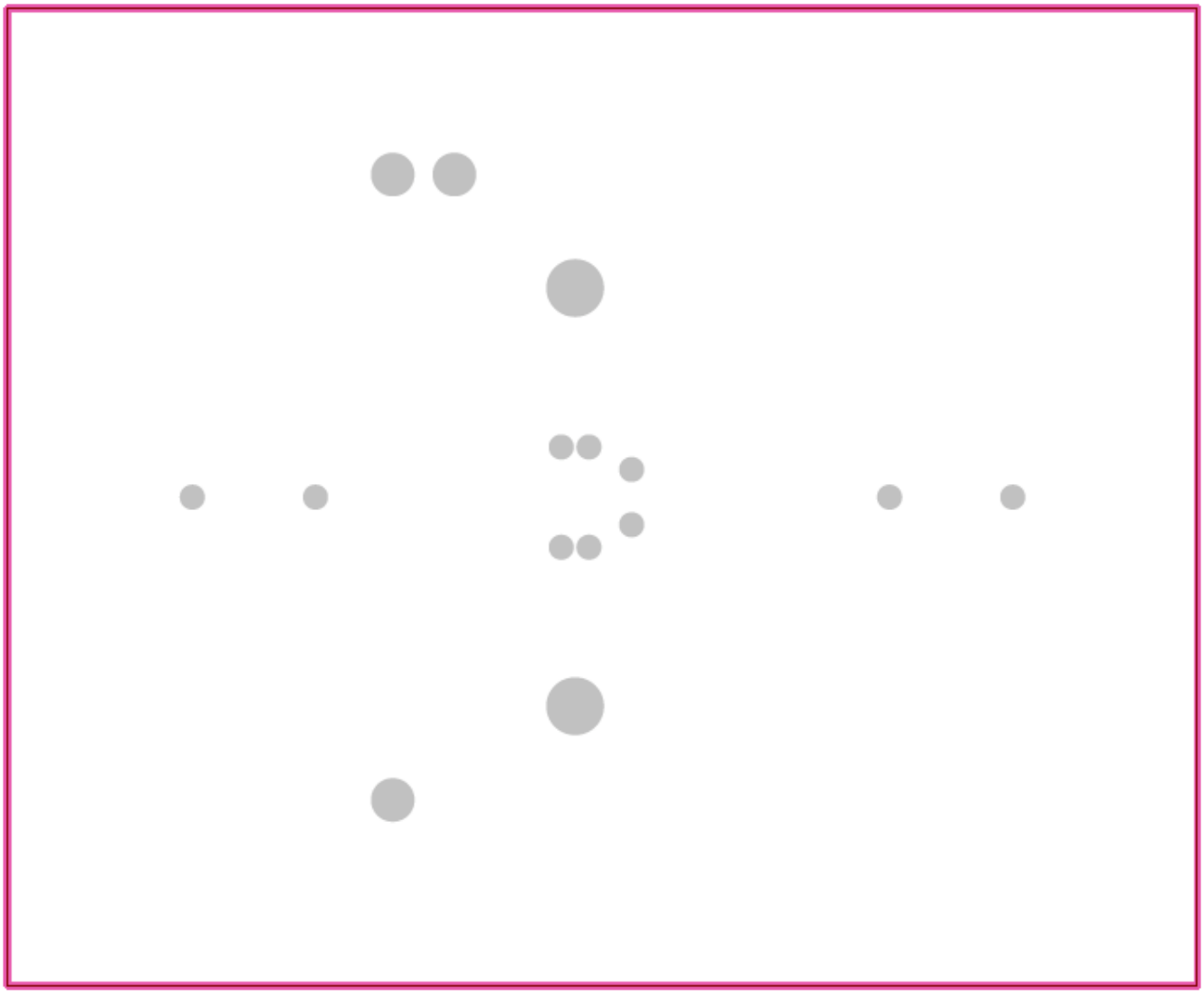

Figure 4. THS4551RGTEVM Layer 3

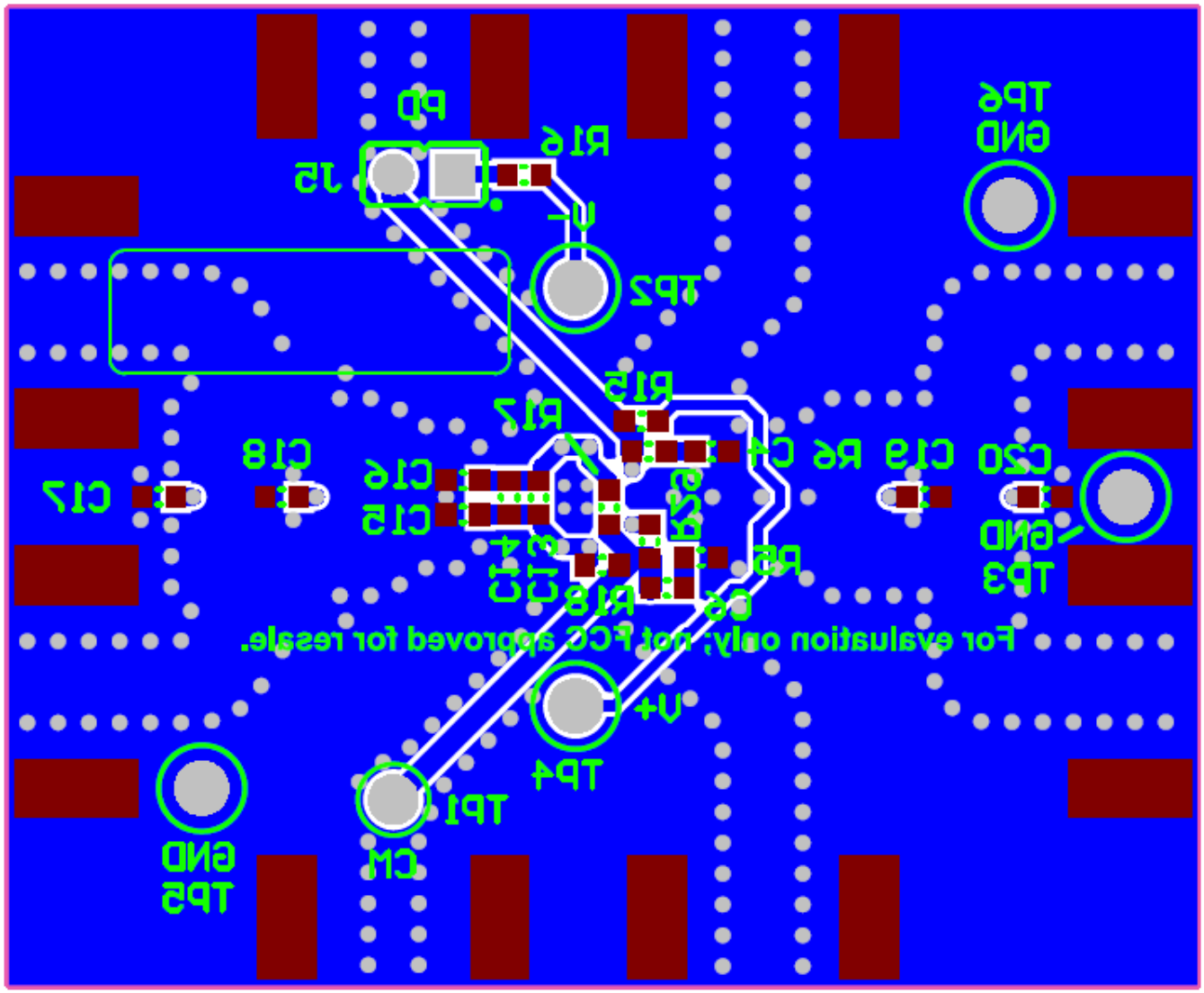

Figure 5. THS4551RGTEVM Bottom Layer

5.3 Bill of Materials

Table 2 lists the EVM bill of materials.

Table 2. THS4551RGTEVM Bill of Materials

Item	Part Reference	Quantity	Part Number	Manufacturer	Description	Note
1	C3, C12	2	GRM188R71C103KA01D	Murata	CAP, CERM, 0.01uF, 16V, +/-10%, X7R, 0603	
2	C4, C6	2	GRM188R61A224KA01D	Murata	CAP, CERM, 0.22 µF, 10 V, +/- 10%, X5R, 0603	
3	C5, C11	2	0603YC104JAT2A	AVX	CAP, CERM, 0.1 µF, 16 V, +/- 5%, X7R, 0603	
4	C7	1	GRM1555C1H1R0CA01D	Murata	CAP, CERM, 1 pF, 50 V, +/- 5%, C0G/NP0, 0402	
5	C8, C10	2	GRM21BR61C106KE15L	Murata	CAP, CERM, 10 µF, 16 V, +/- 10%, X5R, 0805	
6	J1, J2, J8	3	142-0701-806	Emerson Network Power	Connector, End launch SMA, 50 ohm, SMT	
7	J5	1	PBC02SAAN	Sullins Connector Solutions	Header, 100mil, 2x1, Gold, TH	
8	R1, R4, R5, R6, R16	5	CRCW060349R9FKEA	Vishay-Dale	RES, 49.9, 1%, 0.1 W, 0603	
9	R2, R3	2	MCR10EZPJ000	Rohm	RES, 0, 5%, 0.125 W, 0805	
10	R8, R10	2	CRCW0603487RFKEA	Vishay-Dale	RES, 487, 1%, 0.1 W, 0603	
11	R9, R30, R31	3	CRCW060352R3FKEA	Vishay-Dale	RES, 52.3, 1%, 0.1 W, 0603	
12	R12, R13, R19, R20	4	CRCW06030000Z0EA	Vishay-Dale	RES, 0, 5%, 0.1 W, 0603	
13	R15	1	RC0603FR-0749K9L	Yageo America	RES, 49.9 k, 1%, 0.1 W, 0603	
14	R21, R22, R23, R24	4	CRCW06031K00FKEA	Vishay-Dale	RES, 1.00 k, 1%, 0.1 W, 0603	
15	R29	1	CRCW0603100RFKEA	Vishay-Dale	RES, 100, 1%, 0.1 W, 0603	
16	SH-J5_1-OPEN	1	382811-6	AMP	Shunt, 100mil, Gold plated, Black	
17	T2	1	ADTL1-4-75+	Minicircuits	RF Transformer, 75 ohm, 0.5 to 1000 MHz, SMT	
18	TP1	1	5000	Keystone	Test Point, Miniature, Red, TH	
19	TP2	1	5014	Keystone	Test Point, Multipurpose, Yellow, TH	
20	TP3, TP5, TP6	3	5011	Keystone Electronics	Test Point, TH, Multipurpose, Black	
21	TP4	1	5010	Keystone Electronics	Test Point, TH, Multipurpose, Red	
22	U1	1	THS4551IRGTR	Texas Instruments	Low Power, Precision, 150MHz, Fully Differential Amplifier	

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- *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.*
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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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