TPA6040A4 Audio Power Amplifier Evaluation Module

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1 Introduction

1.1 Description

The TPA6040A4 evaluation module consists of a single 2-W stereo speaker amplifier and 85-mW DirectPath™ headphone amplifier complete with a small number of external components mounted on a circuit board that can be used to drive speakers and headphones directly with external analog audio sources as inputs. The TPA6040A4 also contains an LDO capable of outputting 4.75 V with a maximum load of 120 mA.

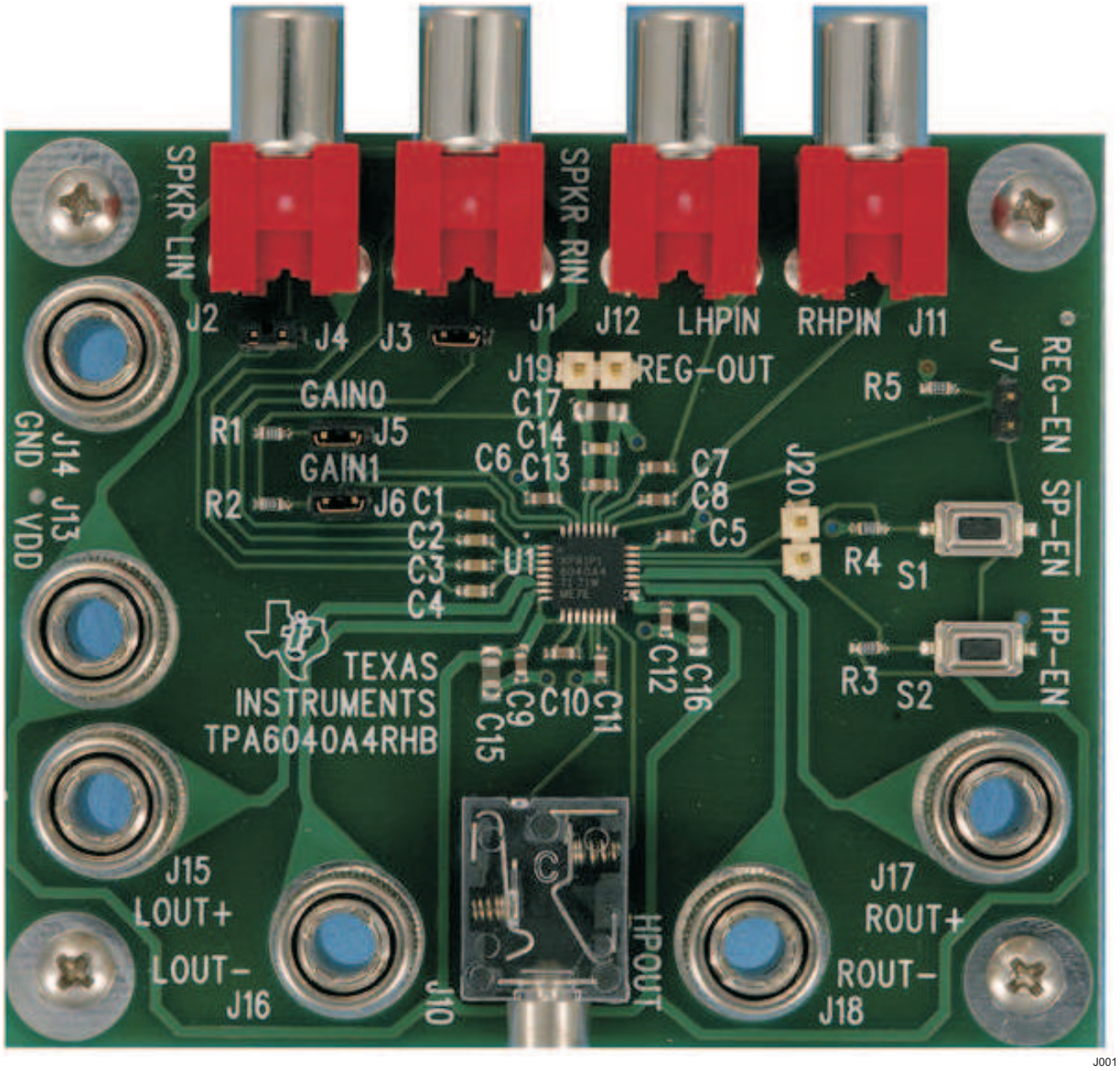

Figure 1. TI TPA6040A4 Audio Power Amplifier EVM – Top View

1.2 TPA6040A4 EVM Specifications

Supply voltage range, VDD	4.5 V to 5.5 V
Supply current, IDD	1 A, maximum
Speaker amplifier output power per channel, P_O: 4Ω, VDD = 5V, THD+N=10%	2 W
Headphone output power per channel, P_O: 32 Ω, VDD = 5V, THD+N=10%	85 mW

2 Operation

2.1 Quick Start List for Stand-Alone Operation

2.1.1 Speaker Amplifier

Follow these steps to use the TPA6040A4 EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM can be made by inserting stripped wire or using banana plugs for the power supply and output connections. The inputs accept standard RCA plugs.

2.1.2 Power Supply

1. Ensure that all external power sources are set to OFF.
2. Connect an external regulated power supply adjusted to 5 V to the module VDD (**J13**) and GND (**J14**) banana jacks, taking care to observe marked polarity.

2.1.3 Evaluation Module Preparations

Inputs and Outputs

1. If connecting to a fully differential input or a grounded input (the shield of the RCA is GND), remove jumpers **J3** and **J4** from the EVM. If connecting to a floating source like a portable CD, install jumpers **J3** and **J4**. After setting the J3 and J4 jumpers appropriately, connect the input source to either the speaker inputs (**J1** and **J2**) or the headphone inputs (**J11** and **J12**) or both.
2. Connect a speaker across +LOUT (**J15**) and –LOUT (**J16**). Connect another speaker across +ROUT (**J17**) and –ROUT (**J18**).
3. Install both gain jumpers GAIN0 (**J5**) and GAIN1 (**J6**). This sets the gain of the amplifier to the lowest level, 6 dB.
4. Connect a set of headphones to the headphone output jack (**J10**).

Control Inputs

1. **Speaker Enable:** This terminal is active-low. A LOW on the device terminal (<0.8 V) enables the amplifier; a HIGH (>2 V) on the device terminal places the amplifier in the SHUTDOWN state. Holding down switch **S1** places the amplifier in the SHUTDOWN state. Releasing **S1** returns the amplifier to the active state.
2. **Headphone Enable:** This terminal is active-high. A LOW on the device terminal (<0.8 V) shuts down the headphone amplifier; a HIGH (>2 V) on the device terminal places the headphone amplifier in the active state. Holding down switch **S2** places the headphone amplifier in the SHUTDOWN state. Releasing **S2** returns the headphone amplifier to the active state.
3. **GAIN0/GAIN1:** Together, these terminals determine the gain of the amplifier. See Table 1. Installing a jumper in **J5** or **J6** sets the respective terminal to GND. Removing the jumper sets the respective terminals to VDD. Removing jumpers **INCREASES** the gain while installing jumpers **DECREASES** the gain. Logic levels are TTL-compatible.

Table 1. Gain Settings

GAIN0 (J5)[1]	GAIN1 (J6)[1]	Amplifier Gain (dB)
ON	ON	6
ON	OFF	10
OFF	ON	15.6
OFF	OFF	21.6

(1) OFF = Jumper REMOVED; ON = Jumper INSTALLED

2.1.4 Power Up

1. Verify correct voltage and input polarity and turn the external power supplies ON. The EVM should begin operation.
2. Adjust the input signal.
3. Adjust the control inputs to the desired settings.
4. Adjust the amplifier gain by installing/removing the gain jumpers, **J5** and **J6**.

3 Schematic and Bill of Materials

3.1 TPA6040A4 EVM Schematic

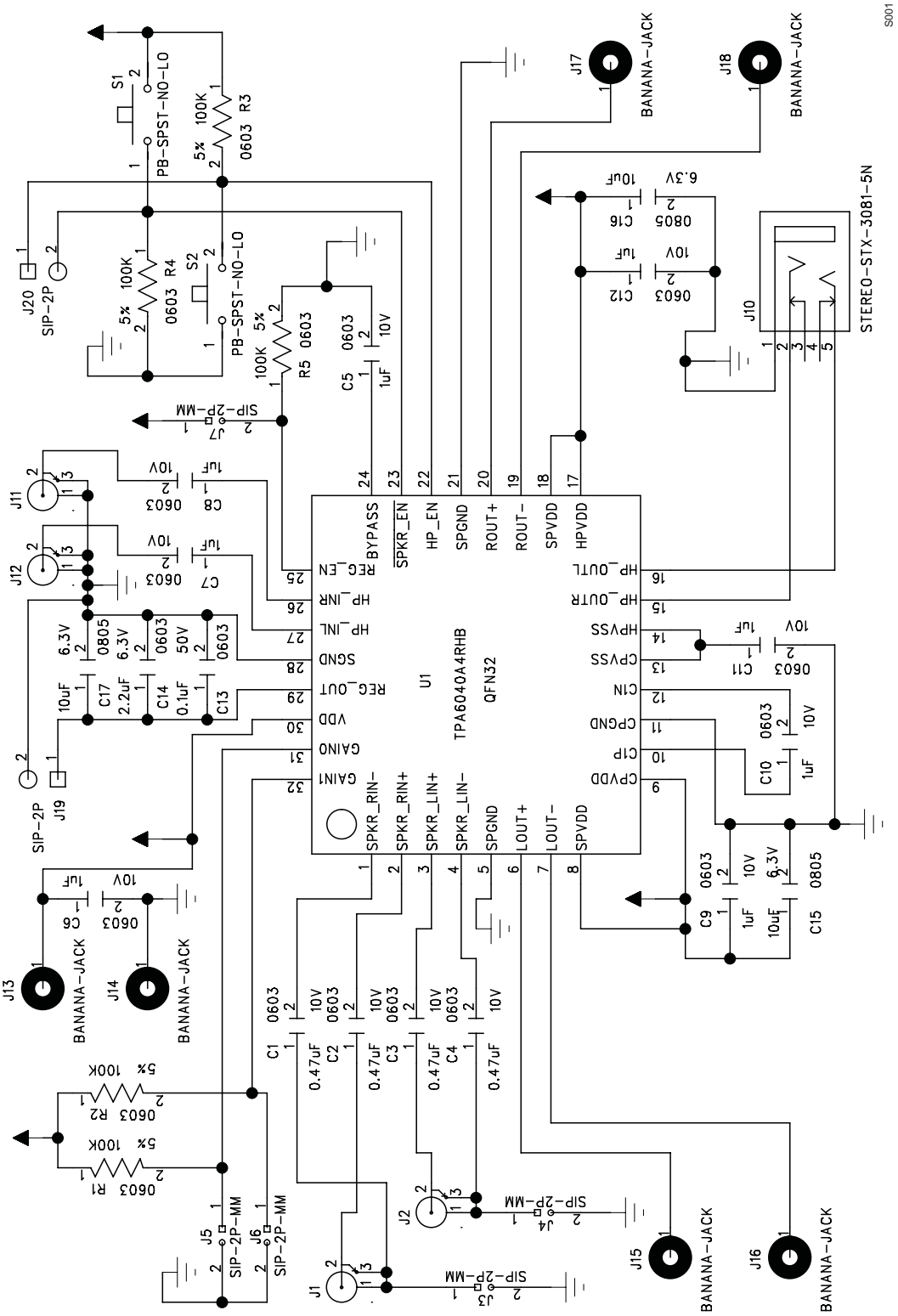

Figure 2. TPA6040A4 EVM Schematic

3.2 TPA6040A4 EVM PCB Layers

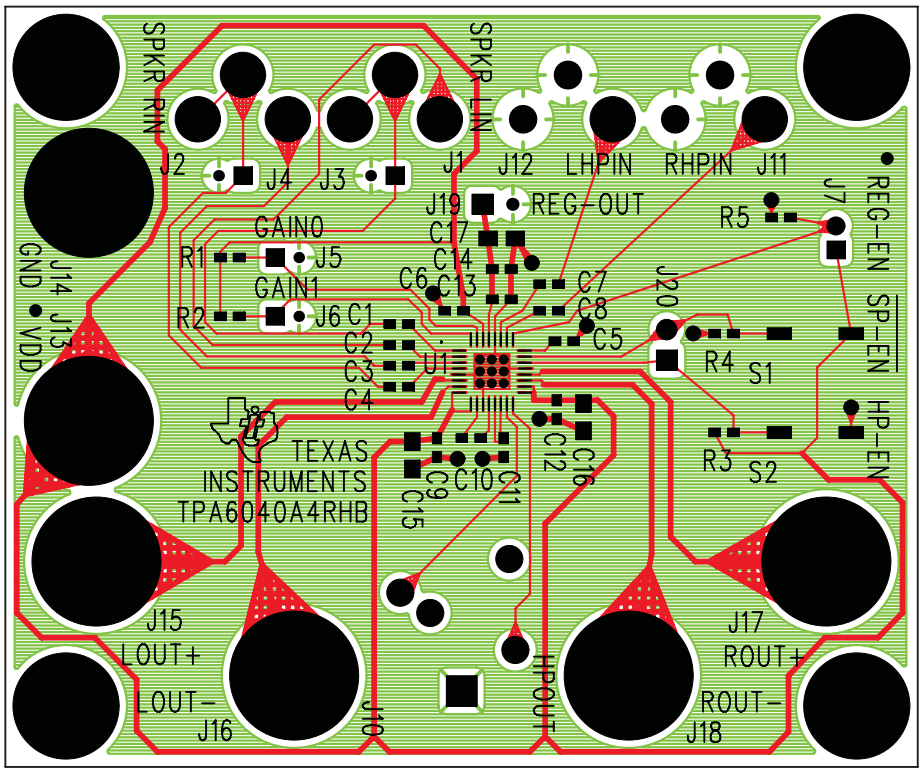

Figure 3. TPA6040A4 EVM – Top Side Layout

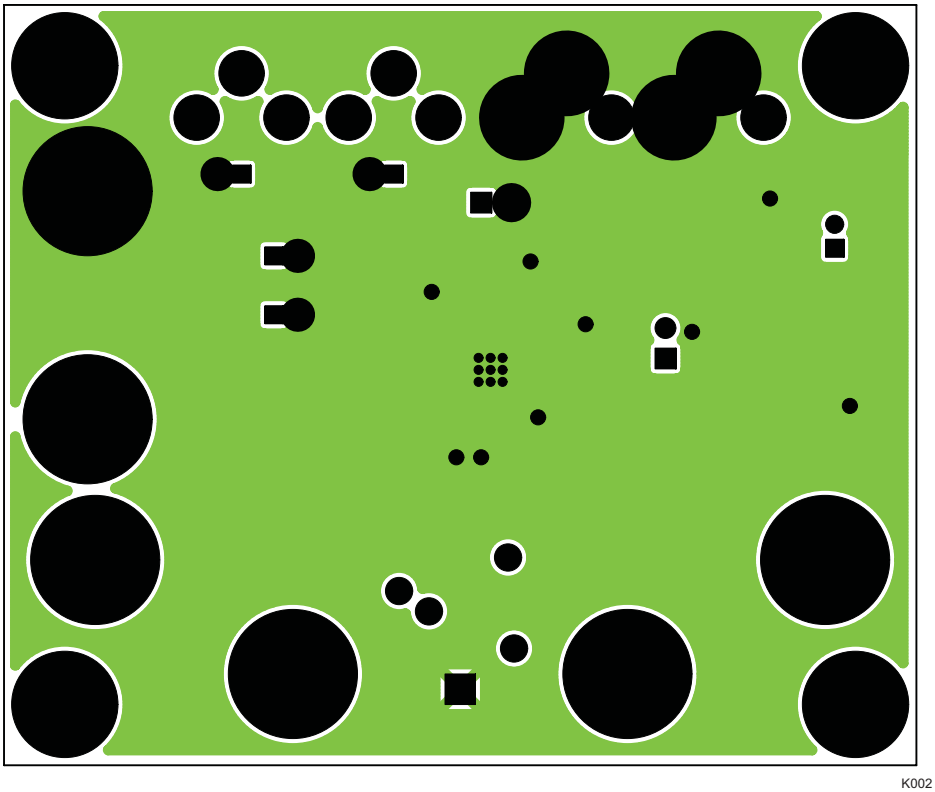

Figure 4. TPA6040A4 EVM – Bottom Side Layout

3.3 TPA6040A4 EVM Bill of Materials

REF.	DESCRIPTION	SIZE	QTY	MFG	PART NO.	VENDOR NO.
C1–C4	Capacitor, ceramic, 0.47-µF, ±10%, X5R, 10-V	0603	4	TDK	C1608X5R1A474K	Digi-Key/445-1320-2-ND
C5–C12	Capacitor, ceramic, 1-µF, ±10%, X5R, 10-V	0603	8	TDK	C1608X5R1A105KT	Digi-Key/445-1321-2
C13	Capacitor, ceramic, 0.1-µF, ±10%, X7R, 50-V	0603	1	TDK	C1608X7R1H104KT	Digi-Key/445-1314-2
C14	Capacitor, ceramic, 2.2-µF, 6.3 V, X5R, 20%	0603	1	TDK	C1608X5R0J225M	Digi-Key/445-1323-1-ND
C15–C17	Capacitor, ceramic, 10-µF, 6.3 V, Y5R, 20%	0805	3	TDK	C2012X5R0J106	Digi-Key/445-1363-1-ND
R1–R5	Resistor, chip, 100 kΩ, 1/10W, 5%	0603	5	Panasonic	ERJ-3GEYJ104V	Digi-Key/P100KG
J1, J2, J11, J12	Phono jack, PC mount, switched		4	Switchcraft	PJRAN1X1U03	Newark/16C1860
J3–J7	Header, 2 position, male	2 mm	5	Norcomp	2163-36-01-P2	Digi-Key/2163S-36
J10	Headphone jack		3	Kycon, Inc.	STX-3081-5N	Mouser/806-STX-3081-5t
J15–J18	Banana jack w/knurled thumbnut (nickel plate)		6	Johnson	111-2223-001	Digi-Key/J587
J19, J20	2 pin 0.1 in. breakaway header	0.1 in.	2	Sullins	PBX26SAAN	Digi-Key/PBC36SAAN
S1, S2	Switch, momentary, SMD, low profile		2	Panasonic	EVQ-PPBA25	Digi-Key/P8086S
U1	TPA6040A4 2-W stereo audio power amplifer	RTV (S-PQFP-N32)	1	TI	TPA6040A4	
32-pin QFN 5-mm sq. and 0,5-mm spacing and exposed thermal pad						

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