

TPA3107D2 Audio Power Amplifier Evaluation Module With LC Filter

This document provides an overview of the Texas Instruments (TI) TPA3107D2 audio amplifier evaluation module. It includes a list of EVM features, a brief illustrated description of the module, and a list of EVM specifications.

Contents

1	Introduction	2
2	Operation	3
3	TPA3107D2 EVM Schematic	5
4	TPA3107D2 EVM PCB Layers	6
5	TPA3107D2 EVM Parts List.....	9

List of Figures

1	TI TPA3107D2 Audio Power Amplifier EVM – Top View.....	2
2	TI TPA3107D2 Audio Power Amplifier EVM – Bottom View.....	2
3	TPA3107D2 EVM Schematic	5
4	TPA3107D2 EVM – Top Layer	6
5	TPA3107D2 EVM – Silkscreen Layer.....	7
6	TPA3107D2 EVM – Bottom Layer.....	8

List of Tables

1	Gain Settings.....	4
2	TPA3107D2 EVM Parts List.....	9

1 Introduction

1.1 Description

The TPA3107D2 evaluation module consists of a single 15-W/channel, class-D, stereo audio power amplifier complete with a small number of external components mounted on a circuit board that can be used to directly drive a speaker with an external analog audio source as the input.

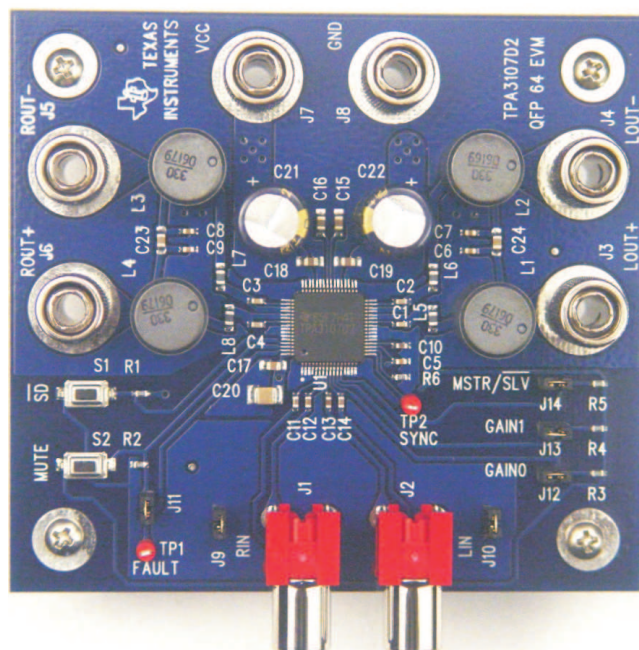


Figure 1. TI TPA3107D2 Audio Power Amplifier EVM – Top View

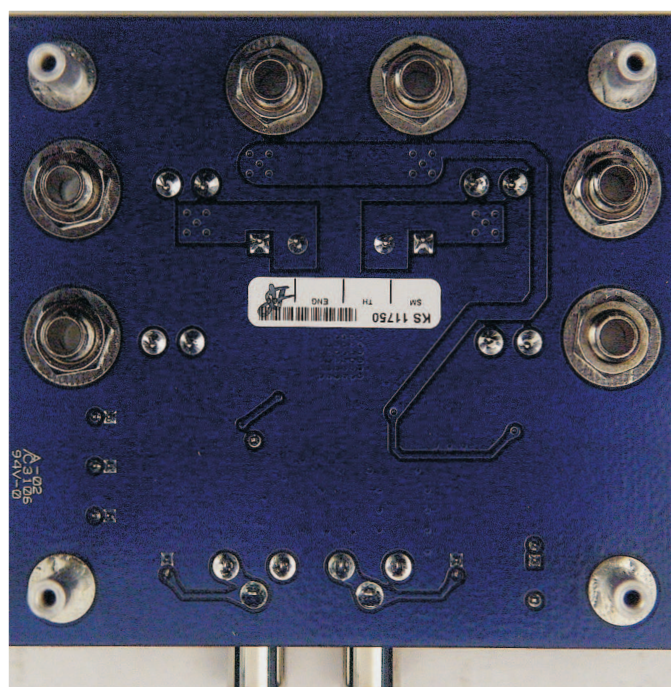


Figure 2. TI TPA3107D2 Audio Power Amplifier EVM – Bottom View

1.2 TPA3107D2 EVM Specifications

V _{CC}	Supply voltage range	10 V to 26 V
I _{CC}	Supply current	4 A max
P _O	Continuous output power per channel, 8 Ω, V _{CC} = 16 V, THD + N = 10%	15 W
R _L	Minimum load impedance	6 Ω

2 Operation

2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the TPA3107D2 EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM module can be made using banana plugs for the power supply and output connections. The inputs accept standard RCA plugs.

2.1.1 Power Supply

1. Ensure that all external power sources are set to OFF.
2. Connect an external regulated power supply adjusted from 10 V – 26 V to the module V_{CC} (**J7**) and GND (**J8**) banana jacks taking care to observe marked polarity.

2.1.2 Evaluation Module Preparations

2.1.2.1 Inputs and Outputs

1. If connecting to a fully differential input or a grounded input (the shield of the RCA jack is GND), remove jumpers **J9** and **J10** from the EVM board. These are located next to the input jacks **J1** and **J2**. If connecting to a floating source, like a portable CD player, install **J9** and **J10**. After setting the **J9** and **J10** jumpers appropriately, connect the audio source to **J1** (RIGHT) and **J2** (LEFT).
2. Connect a speaker across ROUT+ (**J6**) and ROUT- (**J5**). Connect another speaker across LOUT+ (**J3**) and LOUT- (**J4**).
3. Install both gain jumpers GAIN0 (**J12**) and GAIN1 (**J13**). This sets the gain of the amplifier to the lowest level, 20 dB.
4. Remove the jumper at MSTR/ $\overline{\text{SLV}}$ (**J14**). If only one TPA3107D2 is evaluated, it must be configured as the master. If multiple EVMs are connected together using the SYNC output (TP2), the additional EVMs must be configured in the slave mode by installing the **J14** jumper.
5. Remove the jumper **J11**. This places the device in a latched mode when a short-circuit event occurs.

2.1.2.2 Control Inputs

1. **$\overline{\text{SD}}$** : This terminal is active low. A low signal on the device terminal (< 0.8 V) shuts down the amplifier; a high signal (> 2 V) on the device terminal places the amplifier in the active state. Holding down switch **S1** places the amplifier in the SHUTDOWN state. Releasing **S1** returns the amplifier to the active state.
2. **MUTE**: This terminal is active high. A high signal (> 2 V) on this terminal immediately terminates audio playback through the speakers and the outputs stop switching; a low signal (< 0.8 V) enables the device. **S2** on the EVM controls the state of the MUTE terminal. Holding down switch **S2** places the amplifier in the MUTE state. Releasing **S2** returns the amplifier to the active state.
3. **GAIN0/GAIN1**: Together, these terminals determine the gain of the amplifier. Refer to [Table 1](#). Installing a jumper in **J12** or **J13** sets the respective terminal to GND. Removing the jumper sets the respective terminals to VREG (~4 V). Removing jumpers **INCREASES** the gain while installing jumpers **DECREASES** the gain. Logic levels are TTL compatible.
4. **MSTR/ $\overline{\text{SLV}}$** : This terminal is used with the SYNC (**TP2**) output to synchronize the switching frequencies of multiple TPA3107D2 devices. For example, with 2 devices, one would be configured as the MASTER by removing the **J14** jumper. The other EVM would be configured as the SLAVE device

by installing a jumper in the **J14** location. Logic levels are TTL compatible.

Table 1. Gain Settings

GAIN1 (J13)⁽¹⁾	GAIN0 (J12)⁽¹⁾	Amplifier Gain (dB)
ON	ON	20
ON	OFF	26
OFF	ON	32
OFF	OFF	36

⁽¹⁾ OFF = Jumper removed; ON = Jumper installed

2.1.2.3 Control Outputs

1. **FAULT:** This pin is a TTL compatible output for reporting a short-circuit fault on the output. If the outputs are shorted to GND, V_{CC} , or to each other, this terminal goes high and remains high until one of the following operations is performed: power is cycled, SHUTDOWN is cycled, or MUTE is cycled. If jumper **J11** is installed, the MUTE terminal is connected directly to the FAULT terminal and a short-circuit fault is automatically cleared when it occurs.

2.1.3 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. If no sound is audible, check the position of the MSTR/ $\overline{\text{SLV}}$ (**J14**) jumper. It should be removed if evaluating a single EVM.
5. Adjust the amplifier gain by installing/removing the gain jumpers, **J12** and **J13**.

3 TPA3107D2 EVM Schematic

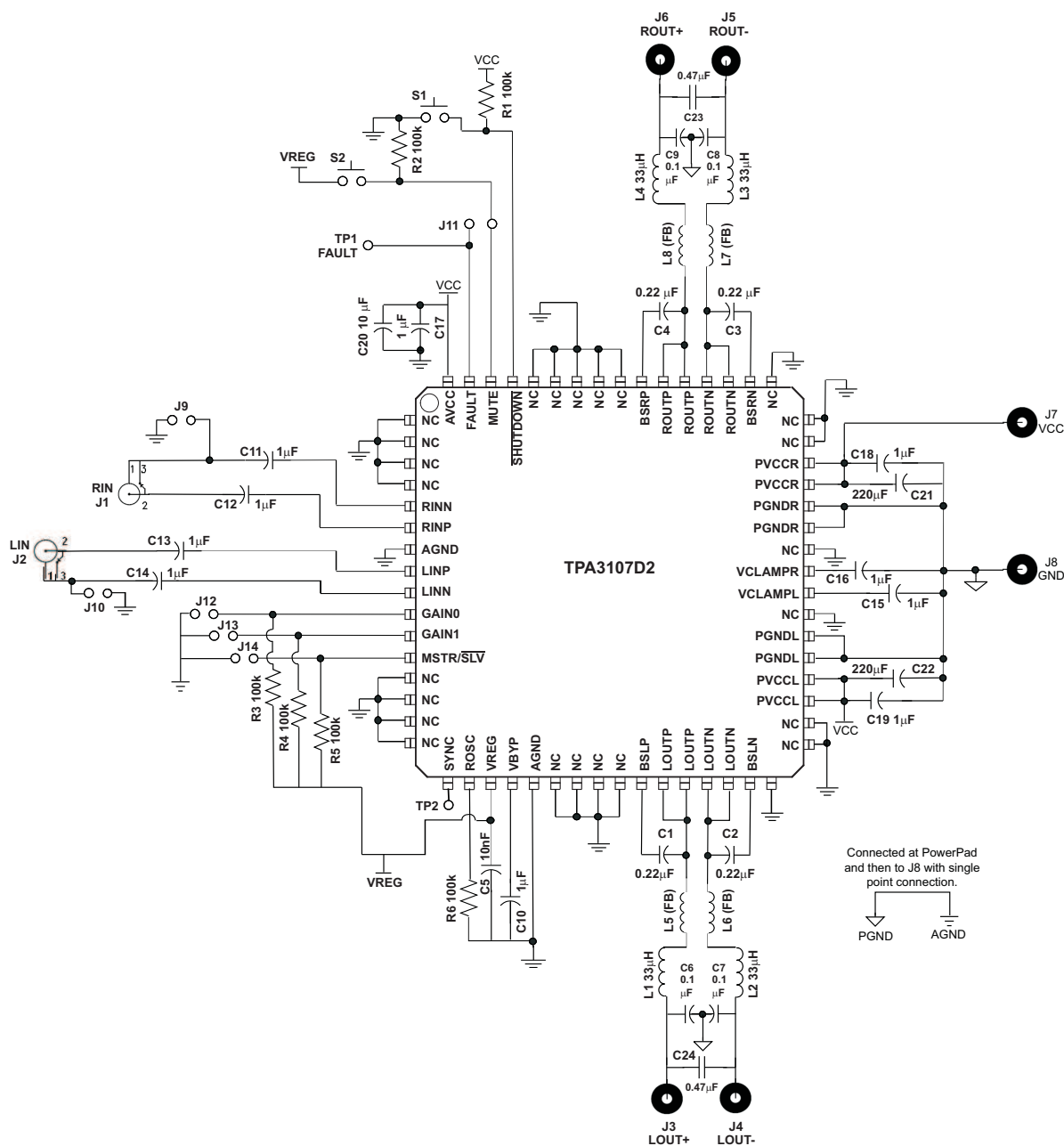


Figure 3. TPA3107D2 EVM Schematic

4 TPA3107D2 EVM PCB Layers

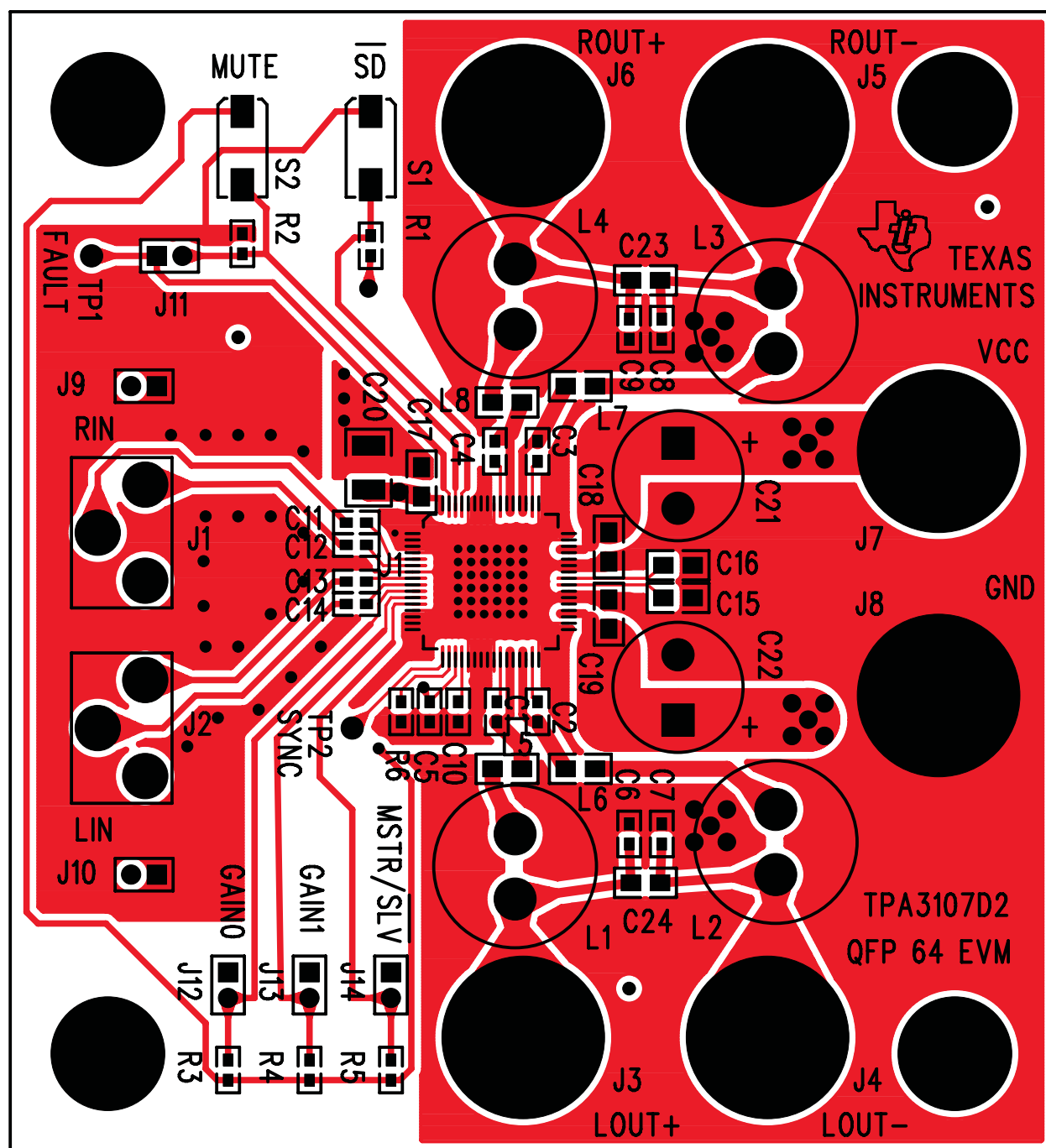


Figure 4. TPA3107D2 EVM – Top Layer

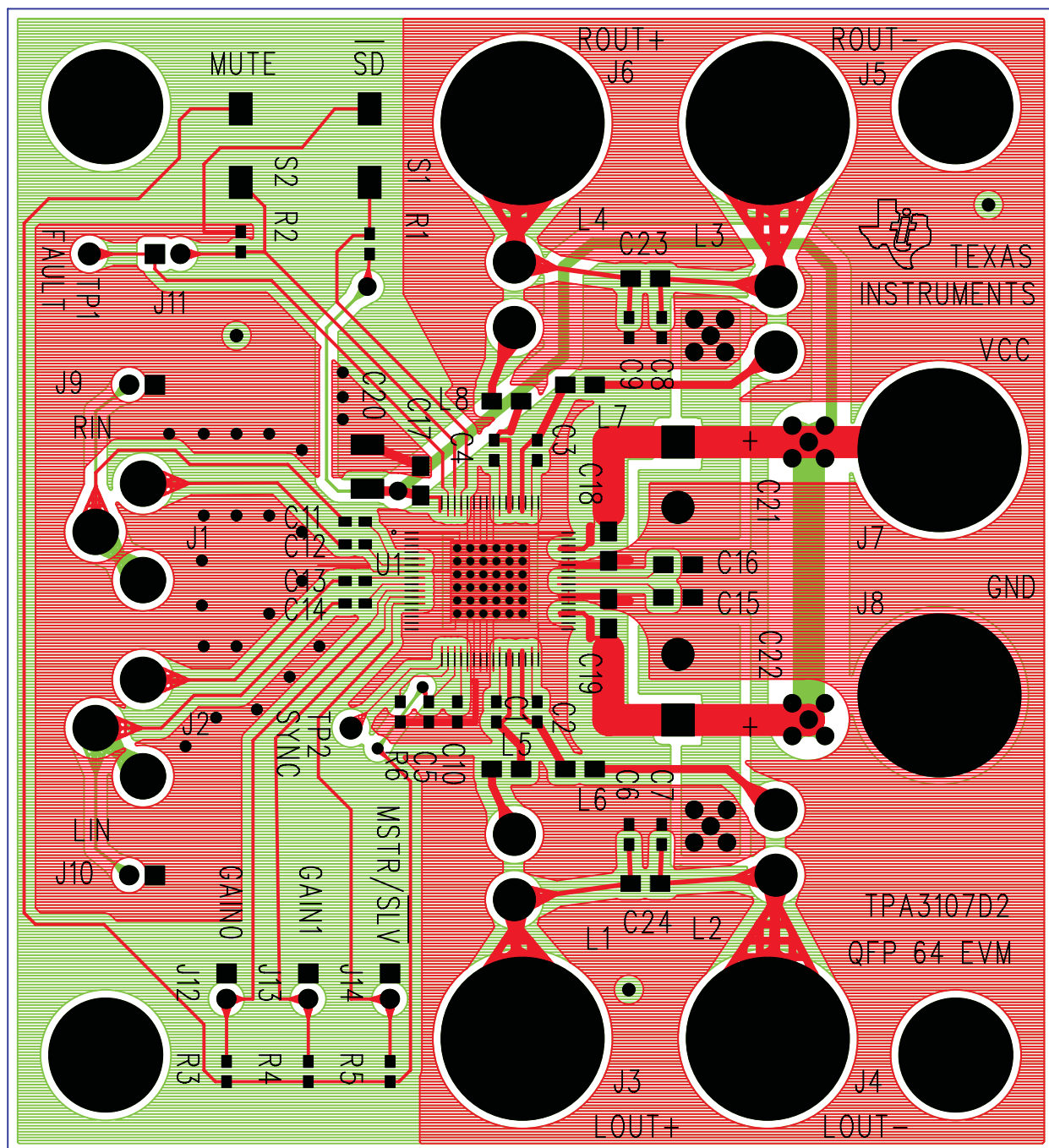


Figure 5. TPA3107D2 EVM – Silkscreen Layer

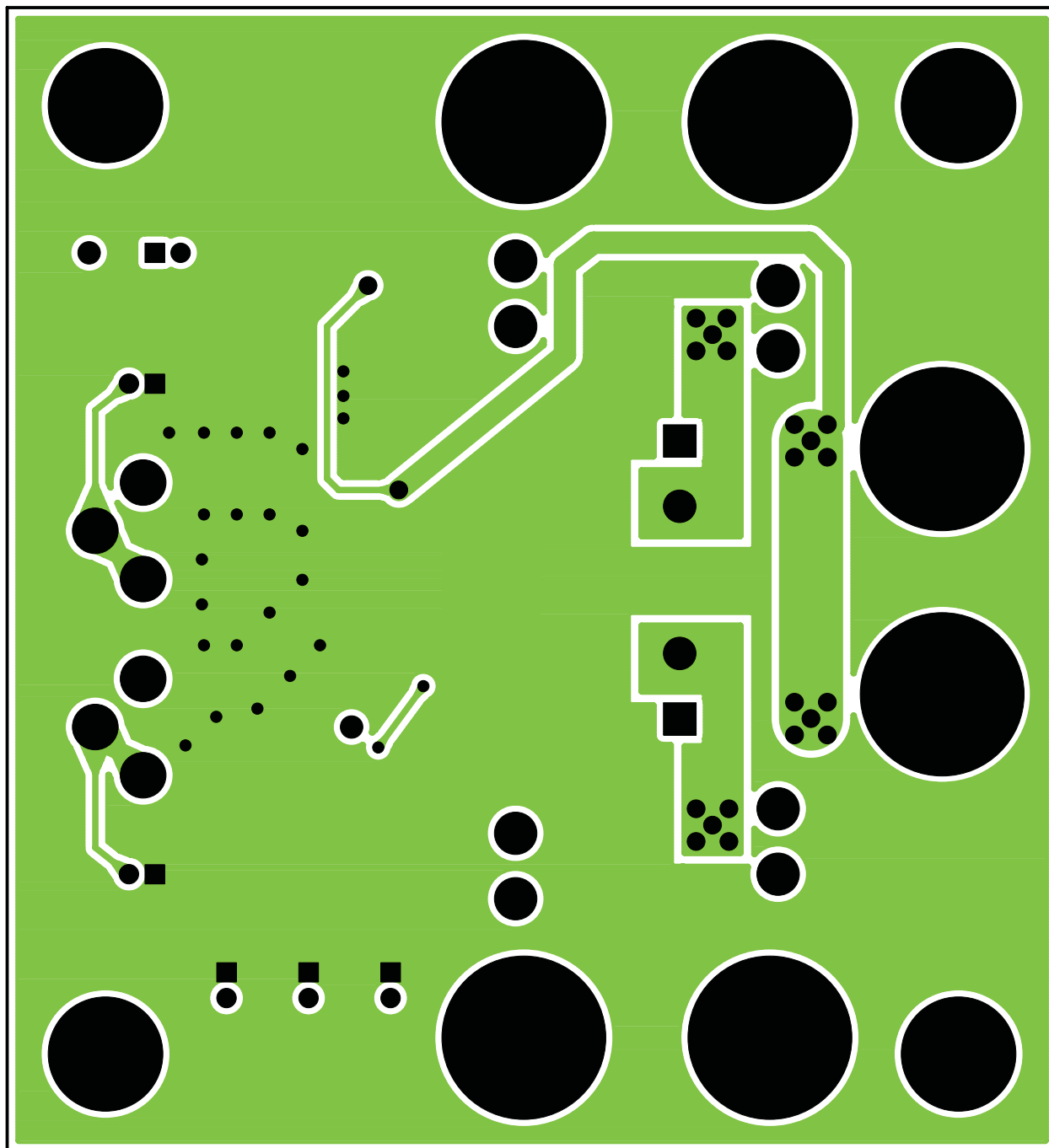


Figure 6. TPA3107D2 EVM – Bottom Layer

5 TPA3107D2 EVM Parts List

Table 2. TPA3107D2 EVM Parts List⁽¹⁾

Ref.	Description	Size	Qty	Mfg	Part #	Vendor #
C1 – C4	Capacitor, ceramic, 0.22μF, ±10%, X7R, 16V	0603	4	TDK	C1608X7R1C224KT	Digi-key/445-1318-2
C5	Capacitor, ceramic, 0.01μF, ±10%, X7R, 50V	0603	1	TDK	C1608X7R1H103KT	Digi-key/445-1311-2
C6 – C9	Capacitor, ceramic, 0.1μF, ±10%, X7R, 50V	0603	4	TDK	C1608X7R1H104KT	Digi-key/445-1314-2
C10 – C14	Capacitor, ceramic, 1.0μF, ±10%, X5R, 10V	0603	5	TDK	C1608X5R1A105KT	Digi-key/445-1321-2
C15 – C19	Capacitor, ceramic, 1.0μF, +80%/–20%, Y5V, 50V	0805	5	TDK	C2012Y5V1H105Z	Digi-key/445-1364-2
C20	Capacitor, ceramic, 10-μF, +80%/–20%, Y5V, 50V	1210	1	Murata	GRM32DF51H106ZA01L	Digi-key/490-1891-2
C21, C22	Capacitor, electrolytic, 220μF, Low impedance	Radial	2	Panasonic	EEU-FC1V221	Digi-key/P10297
L1–L4	Inductor, 33-μH, radial lead, ferrite material, shielded	Radial	4	Toko	A7503AY-330M	
L5-L8	Ferrite Bead, 0.02 ohms DCR, 100 ohms at 100MHz, 4A	0805	4	TDK	MPZ2012S101A	
C23, C24	Capacitor, ceramic, 0.47μF, ±10%, X5R, 35V	0805	2	Taiyo-Yuden	GMK212BJ474KG	
R1 – R6	Resistor, chip, 100kohm, 1/16 W, 5%	0603	6	Panasonic	ERJ-3GEYJ104V	Digi-Key/P100KG
J1, J2	Phono jack, PC mount, switched		2	Switchcraft	PJRN1X1U03	Newark/16C1860
J3 – J8	Banana jack w/knurled thumbnut (nickel plate)		6	Johnson	111-2223-001	Digi-Key/J587
J9 – J14	Header, 2 position, Male	2mm	6	Norcomp	2163-36-01-P2	Digi-Key / 2163S-36
J9 – J14(shunts)	Shunt, 2 mm	2mm	6	Specialty	2JM-G	
TP1, TP2	Test points, 0.040" mounting hole		1	Farnell	240-345	
S1, S2	SWITCH, MOMENTARY, SMD, LOW PROFILE		2	Panasonic	EVQ-PPBA25	Digi-Key/P8086S
	Standoffs, 5/8" length, 4-40 thread		4	Keystone	1808	(Newark) 89F1934
	Screws, 4-40, .375		4			(Digi-Key) H781-ND
U1	TPA3107D2PAP	64-pin QFP, 10 mm x 10 mm	1	TI	TPA3107D2PAP	

⁽¹⁾ All Components should be ordered as lead free.

Related Documentation from Texas Instruments

To obtain a copy of any of the following TI document, call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center (PIC) at (972) 644-5580. When ordering, identify this booklet by its title and literature number. Updated documents can also be obtained through our website at www.ti.com

Data Sheets:

TPA3107D2

Literature Number:

[SLOS509](#)

EVALUATION BOARD/KIT IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein**.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2006, Texas Instruments Incorporated

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of (see the data sheet specifications) and the output voltage range of (see the data sheet specifications).

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2006, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
Low Power Wireless	www.ti.com/lpw

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated