

# **TPA741 MSOP** **Audio Power Amplifier** **Evaluation Module**

## *User's Guide*

## **IMPORTANT NOTICE**

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

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

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.

# Read This First

---

---

---

---

### ***Information About Cautions and Warnings***

This book may contain cautions and warnings.

**This is an example of a caution statement.**

**A caution statement describes a situation that could potentially damage your software or equipment.**

**This is an example of a warning statement.**

**A warning statement describes a situation that could potentially cause harm to you.**

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

### ***Related Documentation From Texas Instruments***

- ***TI Plug-N-Play Audio Amplifier Evaluation Platform*** (literature number SLOU011) provides detailed information on the evaluation platform and its use with TI audio evaluation modules.
- ***TPA741 700-mW LOW-VOLTAGE AUDIO POWER AMPLIFIER*** (literature number SLOS316) This is the data sheet for the TPA741 audio amplifier integrated circuit.

***FCC Warning***

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of 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.

# Contents

---

---

---

|          |  |            |
|----------|--|------------|
| <b>1</b> | <b>Introduction</b>  | <b>1-1</b> |
| 1.1      | Feature Highlights   | 1-2        |
| 1.2      | Description  | 1-3        |
| 1.3      | TPA741 EVM Specifications                                      | 1-3        |
| <b>2</b> | <b>Operation</b>   | <b>2-1</b> |
| 2.1      | Precautions  | 2-2        |
| 2.2      | Quick Start List for Platform                                  | 2-3        |
| 2.3      | Quick Start List for Stand-Alone                               | 2-4        |
| 2.4      | References   | 2-5        |
| 2.4.1    | TPA741 MSOP EVM Connected for BTL Output                       | 2-5        |
| 2.4.2    | TPA741 MSOP EVM Schematic Diagram                              | 2-6        |
| 2.4.3    | TPA741 MSOP Audio Power Amplifier Evaluation Module Parts List | 2-6        |
| 2.4.4    | TPA741 MSOP EVM PCB Layers                                     | 2-7        |

# Figures

---

---

---

|     |   |     |
|-----|---|-----|
| 1-1 | The TI TPA741 Audio Amplifier Evaluation Module | 1-3 |
| 2-1 | Quick Start Platform Map                        | 2-2 |
| 2-2 | Quick Start Module Map                          | 2-4 |
| 2-3 | TPA741 MSOP EVM Connected for Stereo BTL Output | 2-5 |
| 2-4 | TPA741 MSOP EVM Schematic Diagram               | 2-6 |
| 2-5 | TPA741 EVM PCB                                  | 2-7 |
| 2-6 | TPA741 EVM Silkscreen                           | 2-7 |
| 2-7 | TPA741 EVM Top Layer                            | 2-8 |
| 2-8 | TPA741 EVM Bottom Layer                         | 2-8 |

# Tables

---

---

---

|     |  |     |
|-----|--|-----|
| 2-1 | Typical TI Plug-N-Play Platform Jumper and Switch Settings for the TPA741 MSOP EVM | 2-1 |
| 2-2 | Platform Jumper and Switch Settings for the TPA741 MSOP EVM                        | 2-3 |
| 2-3 | TPA741 MSOP EVM Parts List   | 2-6 |



# Introduction

---

---

---

---

This chapter provides an overview of the Texas Instruments (TI) TPA741 MSOP audio amplifier evaluation module (SLOP343). It includes a list of EVM features, a brief description of the module illustrated with a pictorial diagram, and a list of EVM specifications.

| <b>Topic</b>                               | <b>Page</b> |
|--|-------------|
| <b>1.1 Feature Highlights</b> .....        | <b>1-2</b>  |
| <b>1.2 Description</b> .....               | <b>1-3</b>  |
| <b>1.3 TPA741 EVM Specifications</b> ..... | <b>1-3</b>  |

## 1.1 Feature Highlights

The TI TPA741 MSOP audio amplifier evaluation module and the TI plug-n-play audio amplifier evaluation platform include the following features:

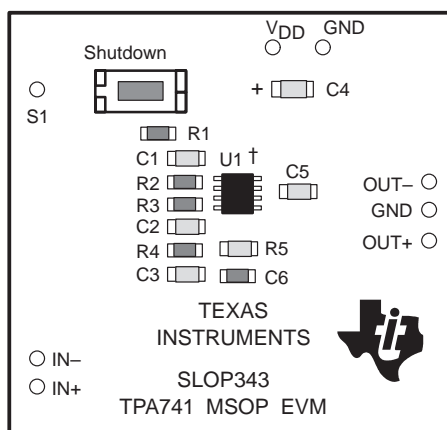
- TPA741 Low-Voltage Audio Power Amplifier Evaluation Module
  - Single channel, bridge-tied load (BTL)
  - 2.5-V and 5.5-V operation
  - 700-mW output power into 8  $\Omega$  at 5 V, BTL
  - Internal depop circuitry
  - Internal thermal and short-circuit protection
  - Module gain is set at  $-4$  V/V in BTL mode,  $-2$  V/V in SE mode
  - Differential signal inputs
- Quick and Easy Configuration with The TI plug-n-play audio amplifier evaluation platform
  - Evaluation module is designed to simply plug into the platform, automatically making all signal, control, and power connections
  - Platform provides flexible power options
  - Jumpers on the platform select power and module control options
  - Switches on the platform route signals
  - Platform provides quick and easy audio input and output connections
- Platform Power Options
  - Onboard 9-V battery
  - External 5-V–15-V ( $V_{CC}$ ) supply inputs
  - External regulated  $V_{DD}$  supply input
  - Socket for onboard 5-V/3.3-V  $V_{DD}$  voltage regulator EVM
  - Onboard overvoltage and reverse polarity power protection
- Platform Audio Input and Output Connections
  - Left and right RCA phono jack inputs
  - Miniature stereo phone jack input
  - Left and right RCA phono jack outputs
  - Left and right compression speaker terminal outputs
  - Miniature stereo headphone jack output



## 1.2 Description

The TPA741 MSOP audio power amplifier evaluation module is a complete, low-power single-channel audio power amplifier. It consists of the TI TPA741 700-mW low-voltage audio power amplifier IC in a very small MSOP package, along with a small number of other parts mounted on a circuit board that is approximately one and a quarter inches square (see Figure 1–1).

Figure 1–1. The TI TPA741 Audio Amplifier Evaluation Module



† Due to the very small size of the MSOP IC package, the standard part number TPA741 is replaced with the code TIAJD.

Single in-line header pins are mounted to the underside of the module circuit board. These pins allow the EVM to be plugged into the TI plug-n-play audio amplifier evaluation platform or to be wired directly into existing circuits and equipment when used stand-alone.

The platform, which has room for a pair of TPA741 MSOP evaluation modules, is a convenient vehicle for demonstrating TI's audio power amplifier and related evaluation modules. The EVMs simply plug into the platform, which automatically provides power to the modules, interconnects them correctly, and connects them to a versatile array of standard audio input and output jacks and connectors. Easy-to-use configuration controls allow the platform and EVMs to quickly model many possible end-equipment configurations.

There is nothing to build, nothing to solder, and nothing but the speakers included with the platform to hook up.

## 1.3 TPA741 EVM Specifications

|  |                         |
|--|-------------------------|
| Supply voltage range, $V_{DD}$                                   | 2.5 V to 5.5 V          |
| Supply current, $I_{DD}$   | 450 mA, max             |
| Continuous output power, $P_O$ : 8- $\Omega$ BTL, $V_{DD} = 5$ V | 700 mW                  |
| Audio input voltage, $V_I$                                       | 2 V <sub>pp</sub> , max |
| Minimum load impedance, $R_L$                                    | 8 $\Omega$              |



## Operation

Follow the steps in this chapter to prepare the TPA741 MSOP audio amplifier EVM for use. Using the TPA741 MSOP EVM with the TI plug-n-play audio amplifier evaluation platform is a quick and easy way to connect power, signal and control inputs, and signal outputs to the EVM, using standard connectors. However, the audio amplifier evaluation module can be used stand-alone by making connections directly to the module pins, and it can be wired directly into existing circuits or equipment.

The platform switch and jumper settings shown in Table 2–1 are typical for the TPA741 MSOP EVM. They cause the TPA741 amplifier IC on the EVM to shut down when a plug is inserted into platform headphone jack J10.

*Table 2–1. Typical TI Plug-N-Play Platform Jumper and Switch Settings for the TPA741 MSOP EVM*

| EVM    | JP6  | JP7 | JP8 | S2         | S3 |
|--------|------|-----|-----|------------|----|
| TPA741 | Mute | X   | Hi  | See Note 2 | X  |

- Notes:**
- 1) X = Don't care
  - 2) Set S2 to ON when signal conditioning board is installed in U1; set S2 to OFF when no signal conditioning board is installed.

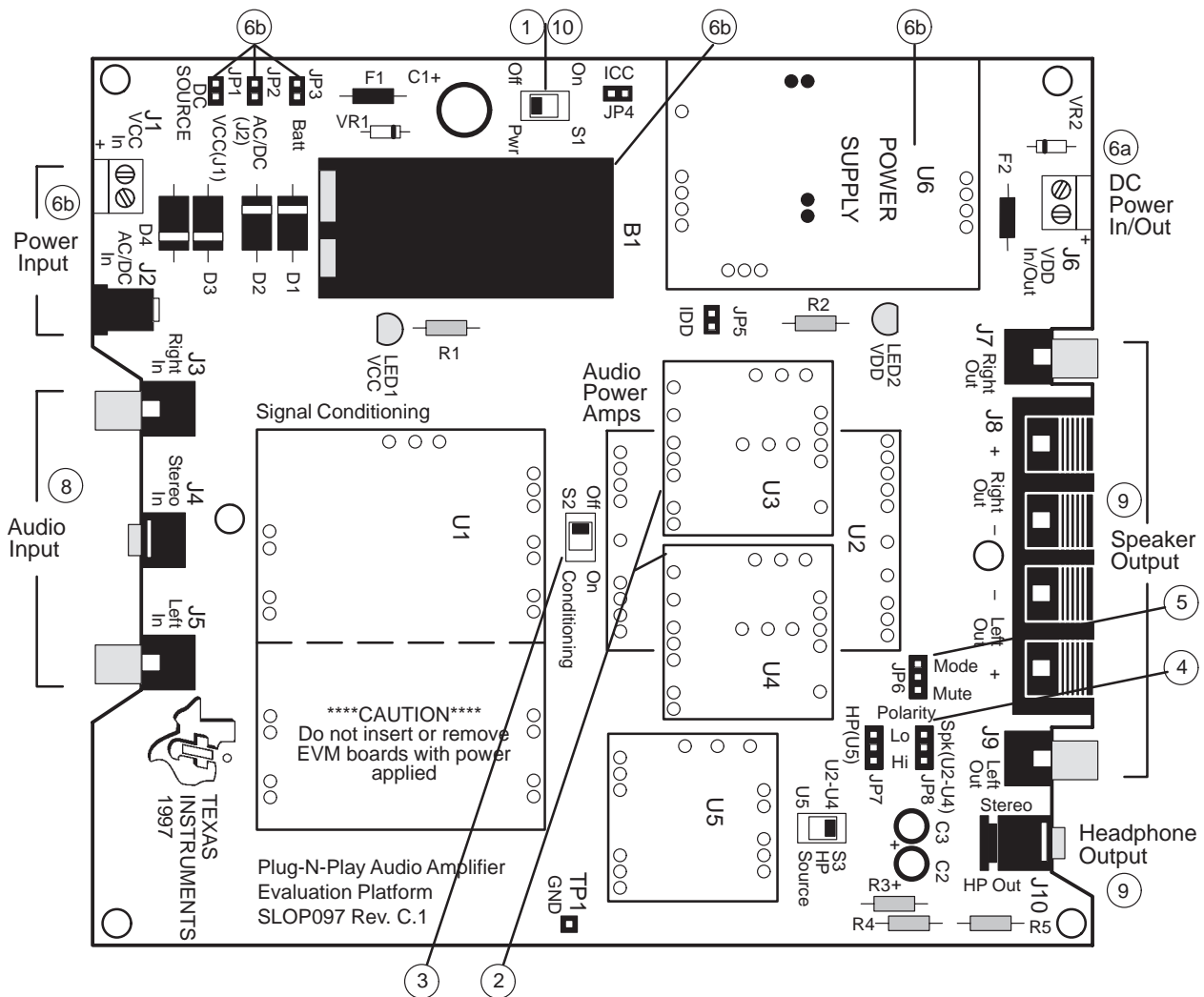
| Topic                                      | Page |
|--|------|
| 2.1 Precautions .....                      | 2–2  |
| 2.2 Quick Start List for Platform .....    | 2–3  |
| 2.3 Quick Start List for Stand-Alone ..... | 2–4  |
| 2.4 References .....                       | 2–5  |

## 2.1 Precautions

**Power Supply Input Polarity and Maximum Voltage**  
 Always ensure that the polarity and voltage of the external power connected to V<sub>CC</sub> power input connector J1, J2, and/or V<sub>DD</sub> power input connector J6 are correct. Overvoltage or reverse-polarity power applied to these terminals can open onboard soldered-in fuses and cause other damage to the platform, installed evaluation modules, and/or the power source.

**Inserting or Removing EVM Boards**  
 Do not insert or remove EVM boards with power applied – damage to the EVM board, the platform, or both may result.

Figure 2–1. Quick Start Platform Map



## 2.2 Quick Start List for Platform

Follow these steps when using the TPA741 MSOP EVM with the TI plug-n-play audio amplifier evaluation platform (see the platform user's guide, SLOU011, for additional details). Numbered callouts for selected steps are shown in Figure 2–1, and details appear in Chapter 3.

### □ Platform preparations

- 1) Ensure that all external power sources are set to off and that the platform power switch S1 is set to off.
- 2) Install a TPA741 MSOP module in platform sockets U3 and U4 for stereo operation (or a module in either U3 or U4 for single channel operation), taking care to align the module pins correctly.
- 3) Use switch S2 to select or bypass the signal conditioning EVM (U1).
- 4) Set control signal polarity jumper JP8 to Hi.
- 5) Set jumper JP6 to select the mute control input (which causes the TPA741 to shut down if a plug is inserted into platform headphone jack J10).

Table 2–2. Platform Jumper and Switch Settings for the TPA741 MSOP EVM

| EVM    | JP6  | JP7 | JP8 | S2         | S3 |
|--------|------|-----|-----|------------|----|
| TPA741 | Mute | X   | Hi  | See Note 2 | X  |

**Notes:** 1) X = Don't care  
 2) Set S2 to ON when signal conditioning board is installed in U1; set S2 to OFF when no signal conditioning board is installed.

### □ Power supply

- 6) Select and connect the power supply:
  - a) Connect an external regulated power supply set to a voltage between 2.5 V and 5.5 V to platform  $V_{DD}$  power input connector J6, taking care to observe marked polarity,  
or
  - b) Install a voltage regulator EVM (SLVP097 or equivalent.) in platform socket U6. Install a 9-V battery in B1 or connect a 7 V–12 V power source to a platform  $V_{CC}$  power input J1 or J2 and jumper the appropriate power input (see platform user's guide).

### □ Inputs and outputs

- 7) Ensure that signal source level is set to minimum.
- 8) Connect the audio source to left and right RCA phono jacks J3 and J5 or to stereo miniature phone jack J4.
- 9) Connect 8- $\Omega$ –32- $\Omega$  speakers to left and right RCA jacks J7 and J9 or to stripped wire connector J8.

### □ Power Up

- 10) Verify correct voltage and input polarity and set the external power supply to ON. If  $V_{CC}$  and an on-board regulator EVM are used to provide  $V_{DD}$ , set platform power switch S1 to on.

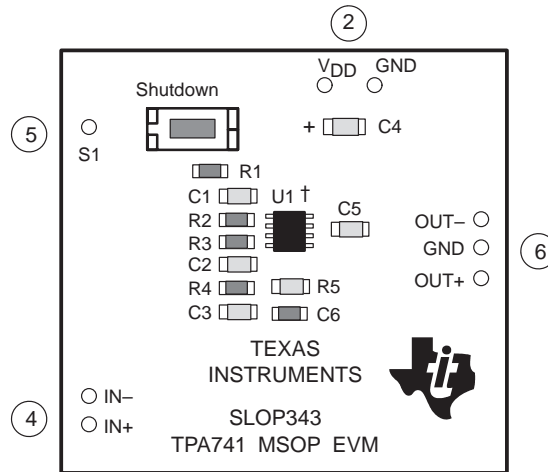
Platform LED2 lights, indicating the presence of  $V_{DD}$ , and the evaluation modules installed on the platform begin operation.

- 11) Adjust the signal source level as needed.

## 2.3 Quick Start List for Stand-Alone

Follow these steps to use the TPA741 MSOP EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the TPA741 MSOP module header pins can be made via individual sockets, wire-wrapping, or soldering to the pins, either on the top or the bottom of the module circuit board. Numbered callouts for selected steps are shown in Figure 2–2 and details appear in Chapter 3.

Figure 2–2. Quick Start Module Map



† Due to the very small size of the MSOP IC package, the standard part number TPA741 is replaced with the code TIAJD.

### Power supply

- 1) Ensure that all external power sources are set to *off*.
- 2) Connect an external regulated power supply set to 5 V to the module  $V_{DD}$  and GND pins, taking care to observe marked polarity.

### Inputs and outputs

- 3) Ensure that the signal source level is set to minimum.
- 4) Connect the positive lead from the audio source to the module IN+ pin and the negative lead to the IN– pin.
- 5) Connect the shutdown S1 pin to  $V_{DD}$  through a normally open switch.
- 6) Connect an 8- $\Omega$ –32- $\Omega$  speaker to the module OUT+ and OUT– pins.

### Power Up

- 7) Verify correct voltage and input polarity and set the external power supply to ON.

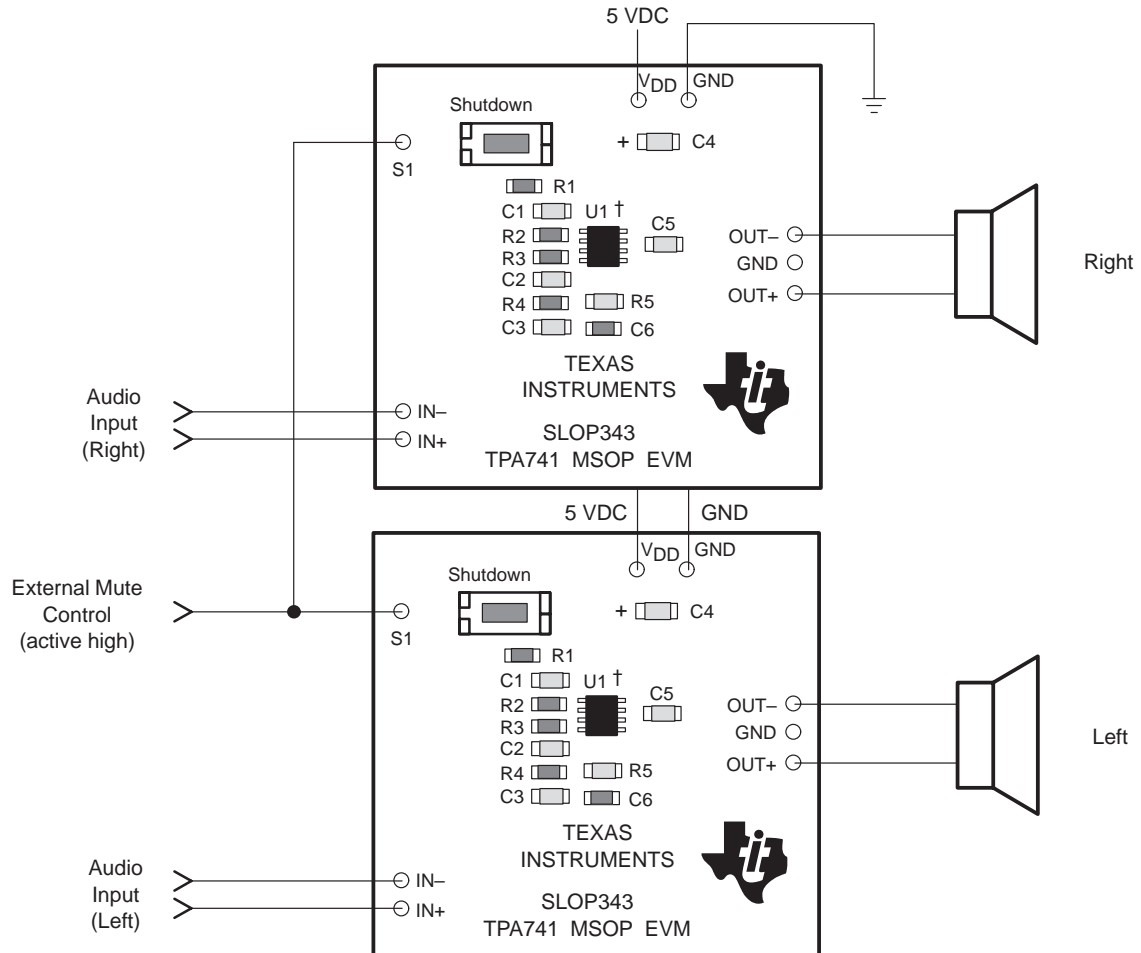
The EVM begins operation.

- 8) Adjust the signal source level as needed.

## 2.4 References

### 2.4.1 TPA741 MSOP EVM Connected for BTL Output

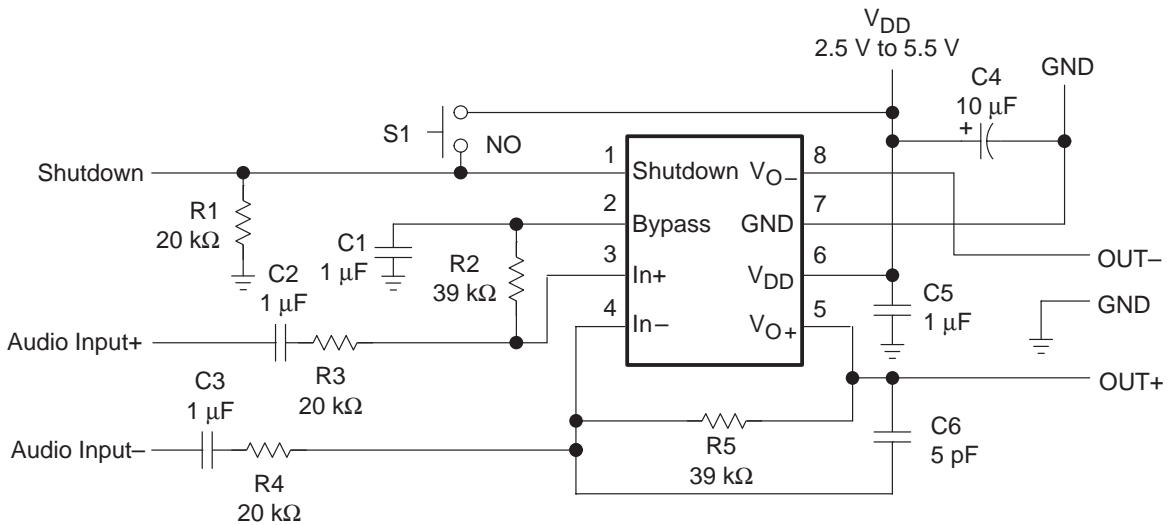
Figure 2–3. TPA741 MSOP EVM Connected for Stereo BTL Output



† Due to the very small size of the MSOP IC package, the standard part number TPA741 is replaced with the code TIAJD.

## 2.4.2 TPA741 MSOP EVM Schematic Diagram

Figure 2–4. TPA741 MSOP EVM Schematic Diagram



## 2.4.3 TPA741 MSOP Audio Power Amplifier Evaluation Module Parts List

Table 2–3. TPA741 MSOP EVM Parts List

| Reference         | Description                                       | Size   | Qty. | Manufacturer/<br>Part Number | Digi-Key<br>Number       |
|-------------------|---|--------|------|------------------------------|--------------------------|
| C4                | Capacitor, 10 $\mu$ F, 6.3 V                      | A      | 1    | Panasonic<br>ECS-TOJY106R    | Digi-Key<br>PCS1106CT-ND |
| C1, C2,<br>C3, C5 | Capacitor, 1 $\mu$ F, 80%/–20%,<br>nonpolarized   | 0603   | 4    | Murata<br>GRM39-Y5V105Z10PT  |                          |
| C6                | Capacitor, pad only                               | 0603   | 0    |                              |                          |
| R1, R3, R4        | Resistor, 20 k $\Omega$ , 1/16 W, 5%              | 0603   | 4    | Panasonic<br>ERJ-3GSYJ203    |                          |
| R5, R2            | Resistor, 39 k $\Omega$ , 1/16 W, 5%              | 0603   | 1    | Panasonic<br>ERJ-3GSYJ393    |                          |
| S1                | Switch, momentary                                 |        | 1    | Panasonic<br>P8048SCT-ND     | Digi-Key<br>P8048SCT-ND  |
|                   | Terminal post headers                             |        | 9    | Sullins<br>PTC36SABN         | Digi-Key<br>S1022-36-ND  |
| U1                | IC, TPA741DGNT†, audio<br>amplifier, 700 mW, mono | MSOP-8 | 1    | TI<br>TPA741DGN              |                          |
| PCB1              | PCB, TPA741 MSOP EVM                              |        | 1    |                              |                          |

† Due to the very small size of the MSOP IC package, the standard part number TPA741 is replaced with the code TIAJD.

**Note:** All items are SMD except as noted.



### 2.4.4 TPA741 MSOP EVM PCB Layers

The following illustrations depict the TPA741 EVM PCB layers and silkscreen. These drawings are not to scale. Gerber plots can be obtained from ant TI sales office.

Figure 2–5. TPA741 EVM PCB

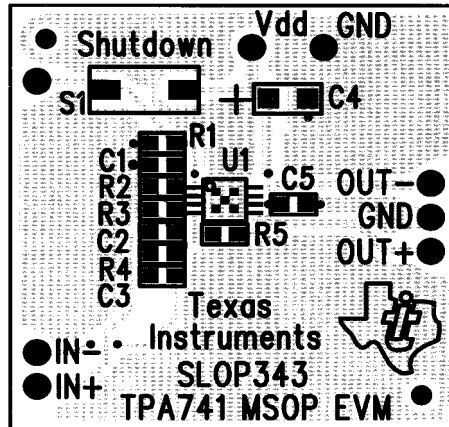


Figure 2–6. TPA741 EVM Silkscreen

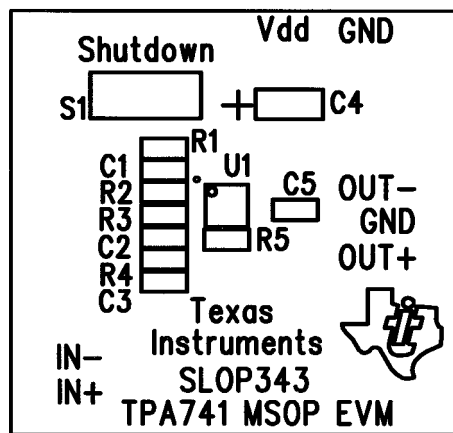


Figure 2–7. TPA741 EVM Top Layer

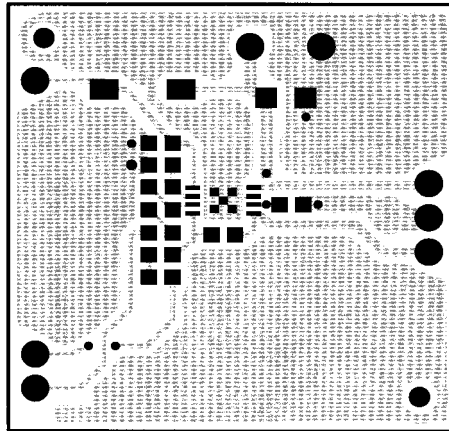
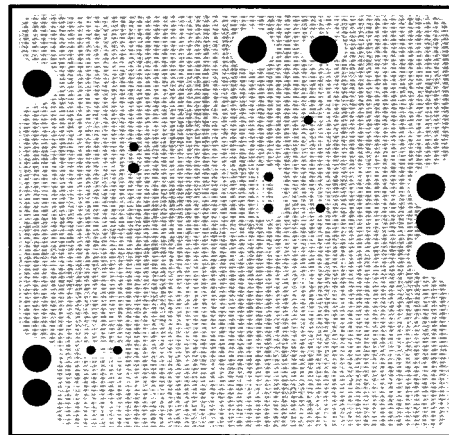


Figure 2–8. TPA741 EVM Bottom Layer





Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.