# TPA6136A2 EVM

This user's guide describes the operation of the TPA6136A2 evaluation module (EVM) for the evaluation of the Texas Instruments TPA6136A2 amplifier and includes the EVM schematic, board art, and bill of materials.

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## 1 Introduction

This section provides an overview of the Texas Instruments (TI) TPA6136A2 DirectPath™ stereo headphone amplifier evaluation module (EVM). It includes a brief description of the module and a list of EVM specifications.

### 1.1 Description

The TPA6136A2 is a DirectPath™ stereo headphone amplifier capable of delivering 25 mW/Ch into 16 Ω and requires no output DC blocking capacitors.

The TPA6136A2 EVM is a complete, stand-alone audio board. It contains the TPA6136A2 WCSP (YFF) DirectPath™ stereo headphone amplifier. All components are Pb-free.

### 1.2 EVM Specifications

| | |
|---|---|
| Supply voltage range, $V_{DD}$ | 2.5 V to 5.5 V |
| Supply current, $I_{DD}$ | 0.5 A, maximum |
| Continuous output power, $P_O$, $V_{DD}$ = 5 V, 16 Ω, THD+N = 1 % | 25 mW |

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# 2 Operation

This section describes how to operate the TPA6136A2EVM.

## 2.1 Quick-Start List for Stand-Alone Operation

Use the following steps when operating the TPA6136A2EVM stand alone or when connecting the EVM into an existing circuit.

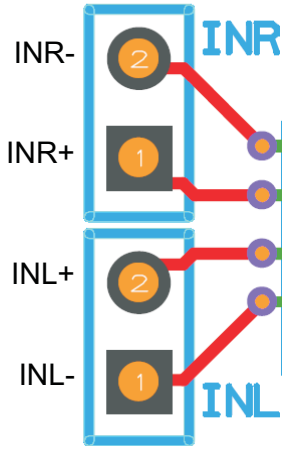
### 2.1.1 Power and Ground

1. Verify that the external power sources are set to OFF.
2. Set the power supply voltage between 2.5 V and 5.5 V. When connecting the power supply to the EVM, first connect the ground connection to the GND connector, and then connect the positive supply to the $V_{DD}$ connector. Verify that the connections are made to the correct pin connector.

### 2.1.2 Inputs and Outputs

#### 2.1.2.1 Audio

1. Verify that the audio source is set to the minimum level.
2. Connect the audio source to the inputs, INL and INR.
3. Connect INL+ and INR+ to ground for single-ended input.
4. Connect a headset or other load to the headphone jack.




#### 2.1.2.2 Shutdown Controls

1. Shutdown is controlled by pushbutton S1. Press and hold S1 to place the TPA6136A2 in shutdown. Release S1 to reactivate the TPA6136A2.

### 2.1.3 Gain Setting

Set the gain of the TPA6136A2 at GAIN. Set GAIN = LOW for 0 dB. Set GAIN = HIGH for 6 dB.

### 2.1.4 HI-Z Control

Output will be in high-Z state when HI-Z = HIGH. Set HI-Z = LOW to disable the high-Z mode.



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### 2.1.5 Power Up

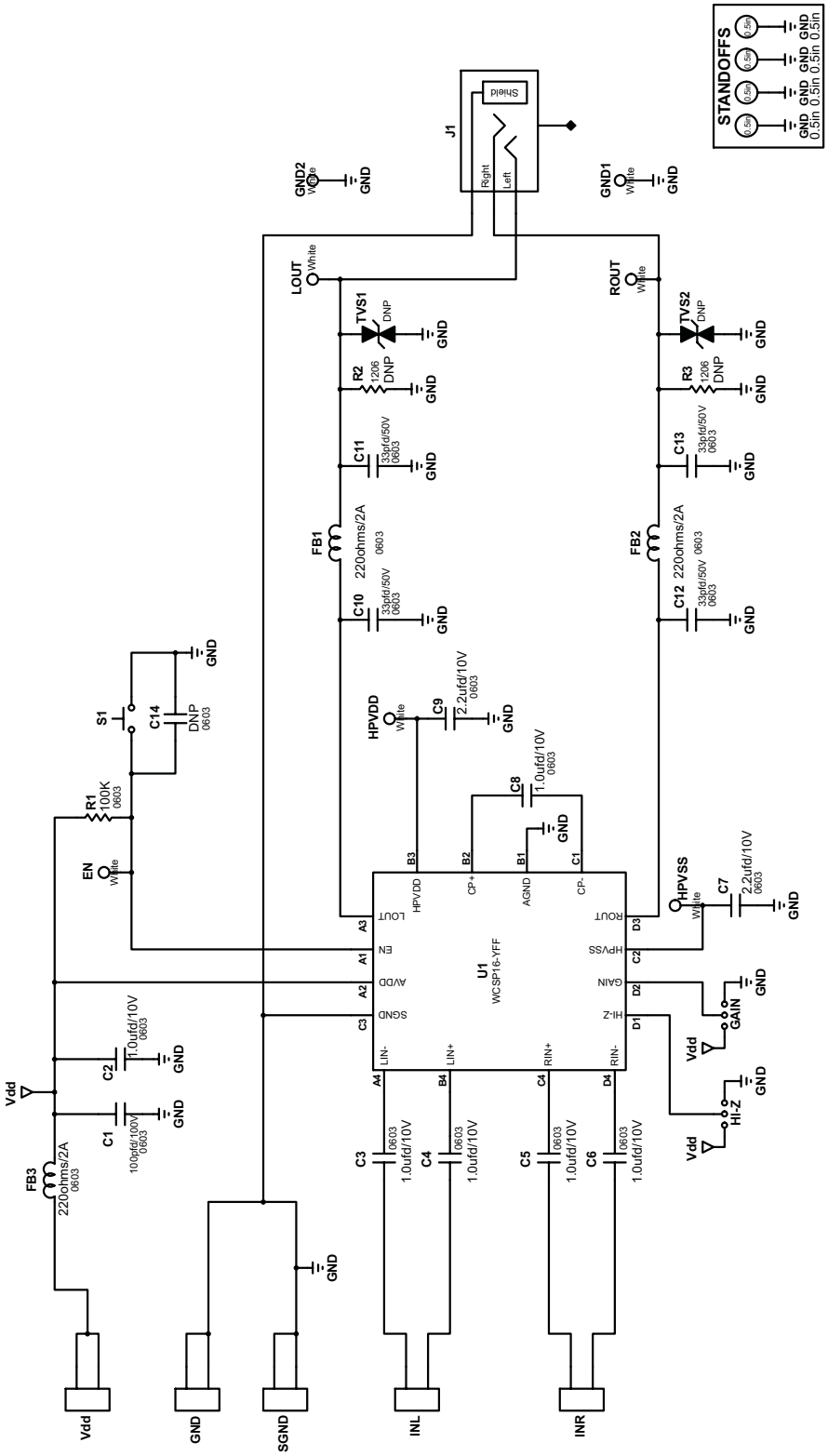
1. Verify the correct connections as described in Sections 2.1.1 and 2.1.2.
2. Verify the correct voltage setting of the power supply and turn ON the power supply. Proper operation of the EVM should begin.
3. Adjust the audio signal source as needed.


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# 3 Reference

This section includes the EVM schematic, board layout reference, and parts list.

## 3.1 TPA6136A2EVM Schematic






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## 3.2 TPA6136A2EVM PCB Layers

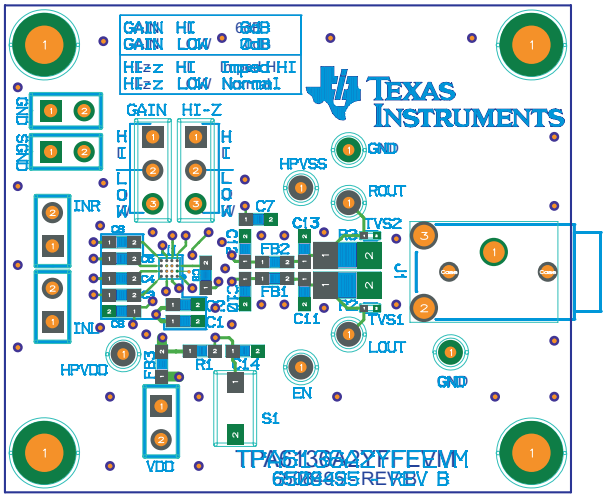



**Figure 1. Top Assembly – X-Ray View**

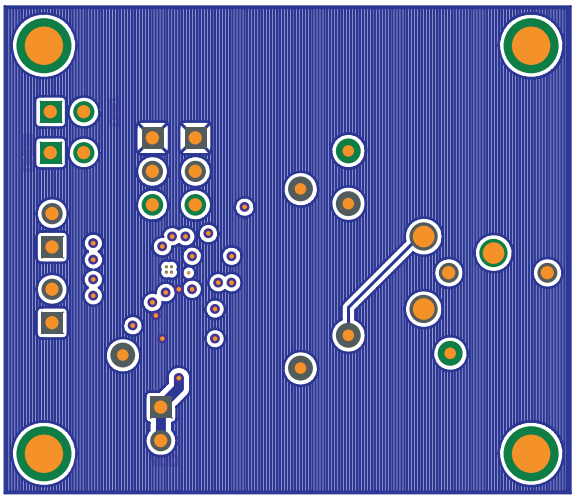


**Figure 2. Layer 2 – X-Ray View**



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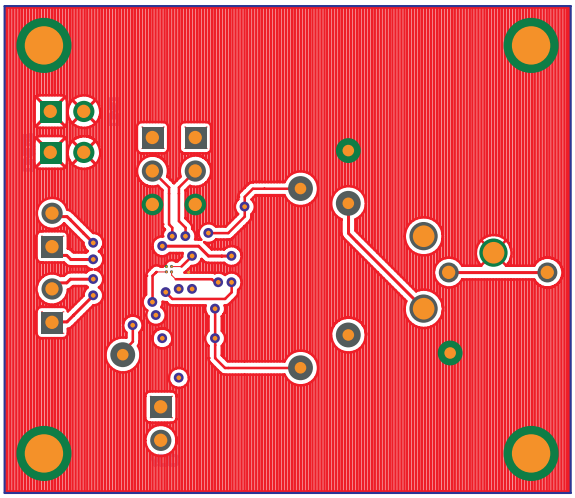


**Figure 3. Layer 3– X-Ray View**

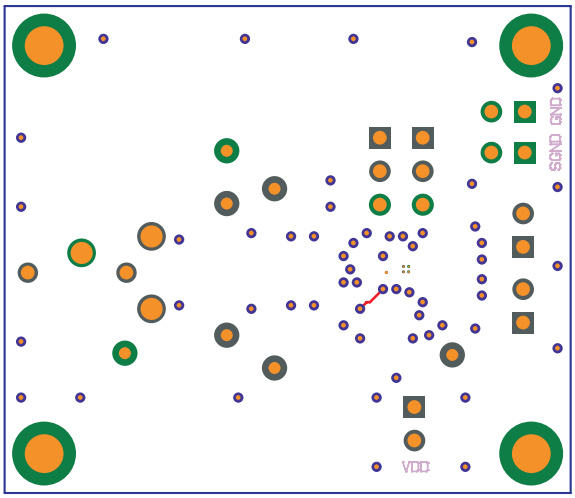



**Figure 4. Bottom Layer – X-Ray View**



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# 4 TPA6136A2EVM Bill of Materials

**Table 1. TPA6136A2EVM Bill of Materials**

| Manufacturer Part No. | Qty | Ref Des | Vendor Part No. | Description | Vendor | Manufacturer |
|---|---|---|---|---|---|---|
| TPA6136A2YFF | 1 | U1 | TPA6136A2YFF | CAP-FREE STEREO HEADPHONE AMP WITH DIFFERENTIAL INPUTS ROHS | Texas Instruments | Texas Instruments |
| **SEMICONDUCTORS** | | | | | | |
| ESDALC6V1-1BT2 | 2 | TVS1, TVS2 | ESDALC6V1-1BT2 | TRANSIENT VOLTAGE SUPPRESSION BIDIR 6.1V 9A SOD-882 ROHS | Mouser | ST Microelectronics |
| **CAPACITORS** | | | | | | |
| ECJ-1VB1A105K | 6 | C2–C6,C8 | PCC2174CT | CAP SMD0603 CERM 1.0µF 10V 10% X5R ROHS | Digi-Key | Panasonic |
| GRM188R71A225KE15D | 2 | C7, C9 | 490-4520-1 | CAP SMD0603 CERM 2.2µF 10V 10% X7R ROHS | Digi-Key | Murata |
| 06031A101JAT2A | 1 | C1 | 478-1146-1 | CAP SMD0603 CERM 100PFD 100V 5% C0G ROHS | Digi-Key | AVX |
| ECJ-1VC1H330J | 4 | C10–C13 | PCC330ACVCT | CAP SMD0603 CERM 33PFD 50V 5% NPO ROHS | Digi-Key | Panasonic |
| **RESISTORS** | | | | | | |
| ERJ-3GEYJ104V | 1 | R1 | P100KGCT | RESISTOR SMD0603 100K Ω 5% THICK FILM 1/10W ROHS | Digi-Key | Panasonic |
| **FERRITE BEADS** | | | | | | |
| MPZ1608S221A | 3 | FB1–FB3 | 445-1565-1 | FERRITE CHIP, 220 Ω 2A 100MHZ SMD 0603 ROHS | Digi-Key | TDK |
| **HEADERS, JACKS AND SHUNTS** | | | | | | |
| PBC02SAAN | 5 | GND, INL, INR, Vdd, SGND | S1011E-02 | HEADER THRU MALE 2 PIN 100LS GOLD ROHS | Digi-Key | Sullins |
| PBC03SAAN | 1 | HI-Z/GAIN | S1011E-03-ND | HEADER THRU MALE 3 PIN 100LS GOLD ROHS | Digi-Key | Sullins |
| STX-3000 | 1 | J1 | 806-STX-3000 | JACK, MINI-STEREO, ROHS | Mouser | Kycon |
| SPC02SYAN | 6 | GND, INL, INR,Vdd, SGND, HI-Z/GAIN | S9001 | SHUNT, BLACK AU FLASH 0.100 ROHS | Digi-Key | Sullins |
| **TEST POINTS AND SWITCHES** | | | | | | |
| 5002 | 7 | EN, GND1, GND2, LOUT, ROUT, HPVDD, HPVSS | 5002K | PC TEST POINT, WHITE, ROHS | Digi-Key | Keystone Electronics |
| TL1015AF160QG | 1 | S1 | EG4344CT | SWITCH, MOM, 160G SMT 4×3MM ROHS | Digi-Key | E-Switch |
| **STANDOFFS AND HARDWARE** | | | | | | |
| 2027 | 4 | SO1,SO2,SO3,SO4 | 2027K | STANDOFF, 4-40, 0.5INx3/16IN, ALUM RND F-F | Digi-Key | Keystone Electronics |
| | | | | | | |
| Component Count | 45 | | | | | |
| **COMPONENTS NOT ASSEMBLED** | | | | | | |
| R2, R3, C14 | | | | | | |


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## EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of HPVSS - 0.3 V to HPVDD + 0.3 V and the output voltage range of HPVSS to HPVDD.

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.

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