TPA2100P1

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1 Introduction

This section provides a description and summary specifications for the TI TPA2100P1 audio amplifier.

1.1 Description

The TPA2100P1 is a mono Class-D amplifier with built-in 10 V boost converter designed for piezo and ceramic speakers. The TPA2100P1 drives up to 19 V_{PP} mono bridge-tied-load (BTL) from a 2.5-V power supply at less 1% total harmonic distortion plus noise (THD+N). The TPA2100P1 is available in a WCSP package. All components are lead-free.

1.2 Summary Specifications

V_{DD}	Supply voltage range	–0.3 V to 5.5 V
I_{DD}	Supply current	3 A Maximum
$V_O$max	Output voltage	19 V_{PP}
V_I	Audio Input Voltage	–0.3 V to V_{DD} + 0.3 V

2 Operation

This section describes how to operate the TPA2100P1.

2.1 Quick Start List for Stand-Alone Operation

Use these procedures when operating the TPA2100P1 as a stand-alone or when connecting it to existing circuits or equipment.

2.1.1 Power and Ground

1. Make sure 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, make sure to attach the ground connection to the GND banana jack, **GND**, first and then connect the positive supply to the V_{DD} banana jack, $\mathbf{V_{DD}}$. Verify that the connections are made to the correct banana jacks.

NOTE: Do not connect V_{DD} to the V_{CC} header pin. This can damage the device.

2.1.2 Audio

1. Make sure that the audio source is set to the minimum level.
2. Connect the audio source to the input RCA jack **IN**. Shunt JP1 for single-ended audio source.
3. Connect speaker to the output banana jacks **OUT+** and **OUT–**.
4. Locations are provided for an on board RC low-pass filter for audio measurement. Use test points TP1, TP2 and GND. The user must add the filter components R3, R4; typical value is 1 kΩ.
5. Locations are provided for EMC filter capacitors, C13 and C14. The values are between 330 pF and 1 nF.

2.1.3 Gain Control

The TPA2100P1 has three gain settings:

1. Use jumper **GAIN** to set the gain. To achieve 24 dB, place the jumper between pin 1 and pin 2; for 12 dB, shunt head 2 and head 3; for 16 dB, remove the jumper and let the gain pin float.

2.1.4 Shutdown Controls

1. The TPA2100P1 provides independent shutdown controls for the Class-D amplifier and the boost converter. Pins $\overline{SD}$ and $\overline{SDa}$ shut down the boost converter and Class-D amplifier, respectively. They are active low. Press and hold pushbutton **S1** to place the boost converter in shutdown. Release pushbutton **S1** to activate the boost converter.
2. Press and hold pushbutton **S2** to shutdown the Class-D amplifier. Release pushbutton **S2** to activate the Class-D amplifier.

NOTE: The boost converter provides power to the Class-D amplifier. When the boost converter is shut down, no voltage is supplied to the Class-D amplifier causing the Class-D amplifier to power off.

2.2 Boost Settings

See the data sheet (SLOS595) for choosing the boost converter inductor and capacitors.

3 TPA2100P1 Schematic

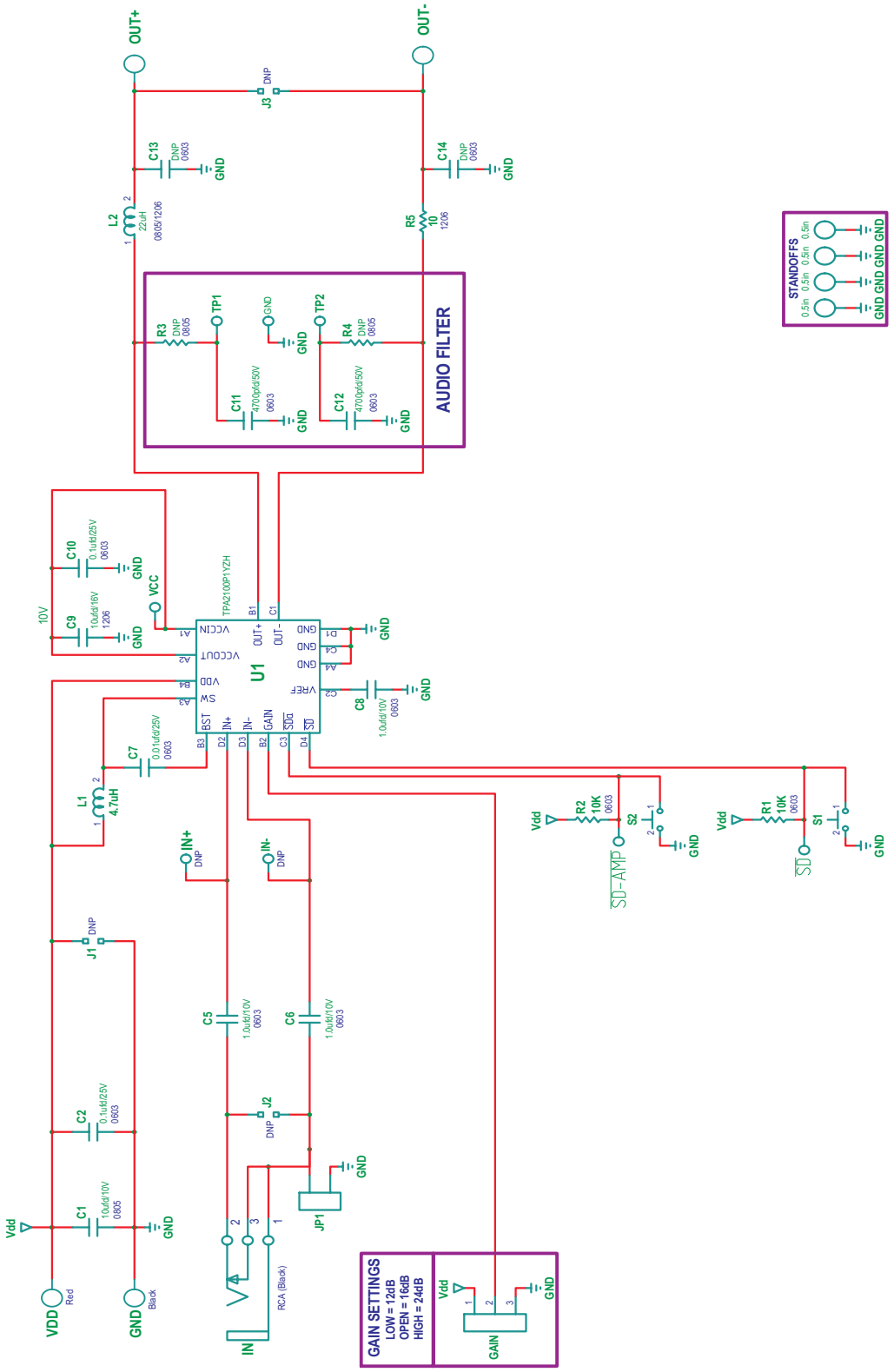

Figure 1. TPA2100P1 – YZH Package – Schematic Revision A

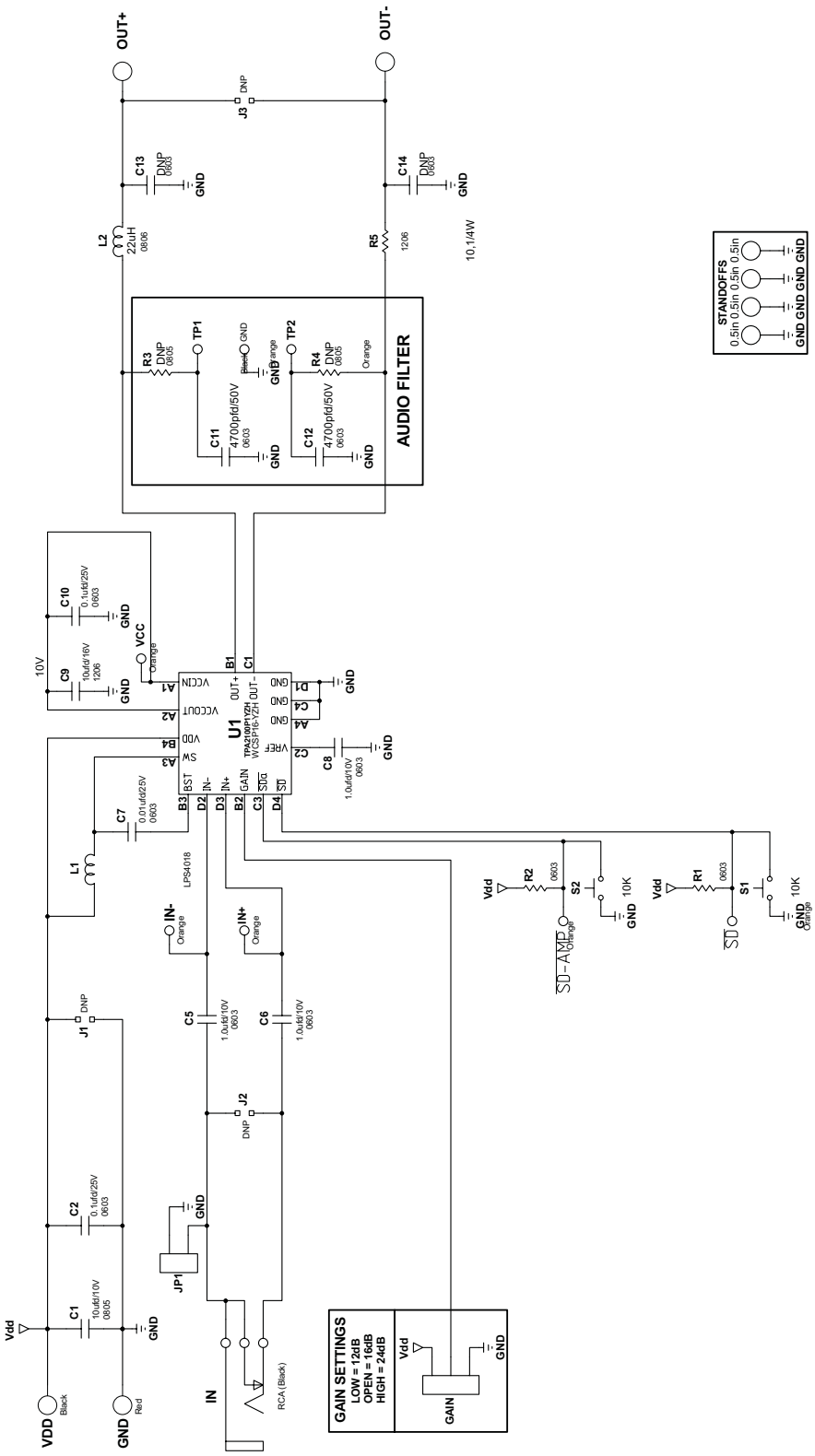

Figure 2. TPA2100P1 – YZH Package – Schematic Revision B

4 TPA2100P1 PCB Layers

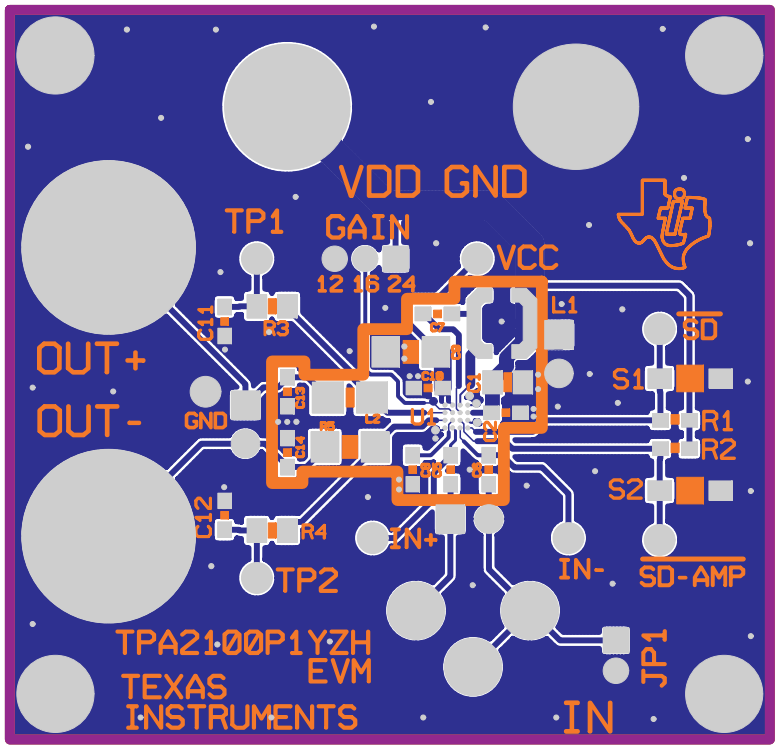

Figure 3. TPA2100P1 – YZH Package – Top Layer Revision A

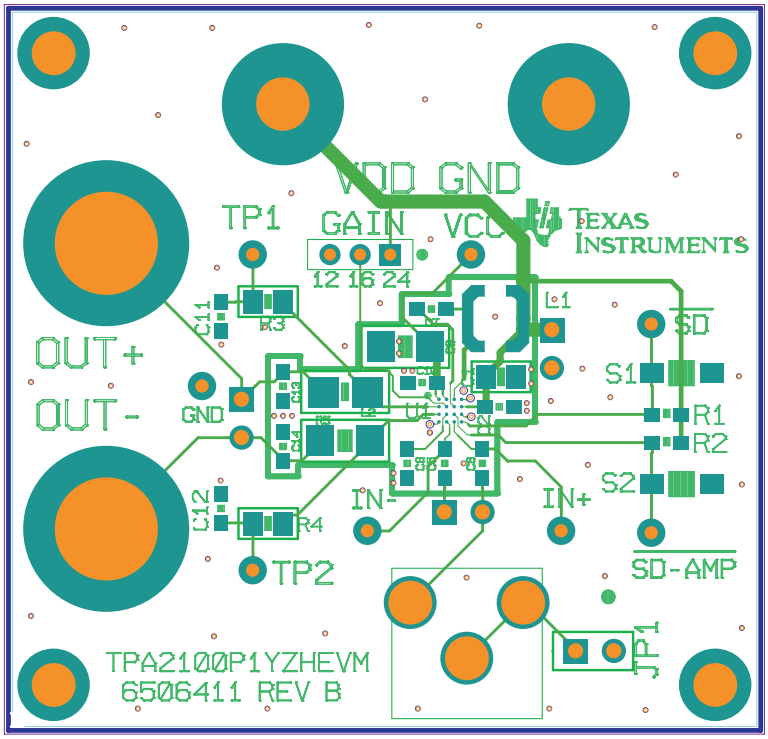

Figure 4. TPA2100P1 – YZH Package – Top Layer Revision B

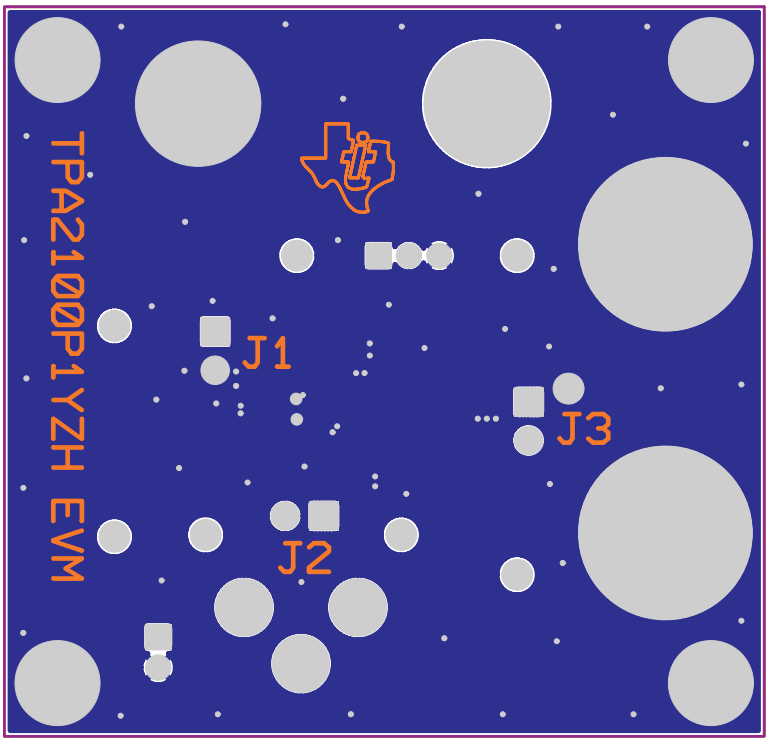

Figure 5. TPA2100P1 – YZH Package – Bottom Layer Revision A

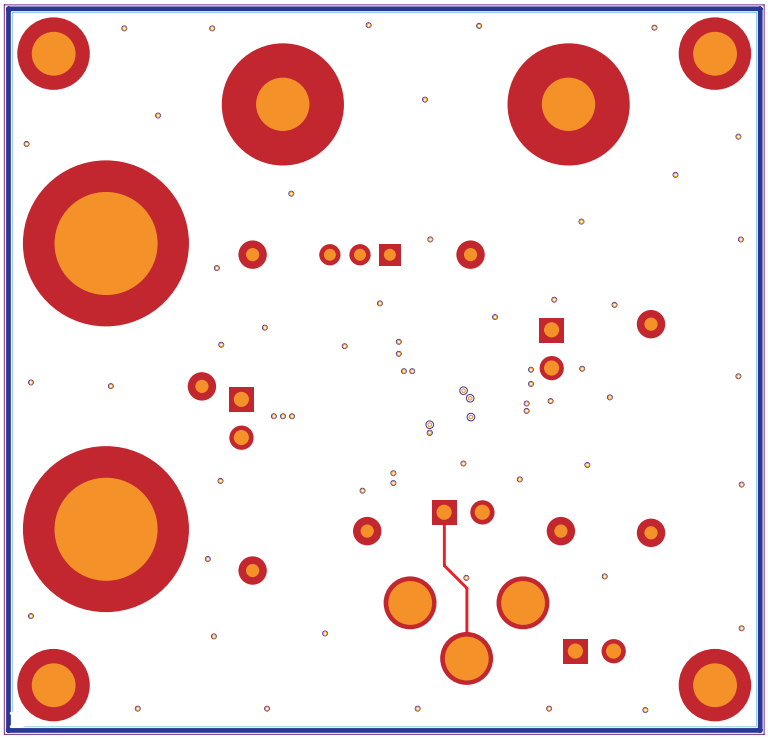

Figure 6. TPA2100P1 – YZH Package – Bottom Layer Revision B

5 TPA2100P1 Bill of Materials

Table 1. BILL OF MATERIALS for TPA2100P1YZH_EVM

ITEM	MANUFACTURER PART NUM	QTY	REF DES	VENDOR PART NUM	DESCRIPTION	VENDOR	MANUFACTURER
TI-SEMICONDUCTORS							
1	TPA2100P1YZH	1	U1	TPA2100P1 YZH	MONO SPEAKER AMP W/BOOST CONVERTER WCSP16-YZH ROHS	Texas Instruments	Texas Instruments
CAPACITORS							
2	C1608X5R1A105K	3	C5, C6, C8	445-1321-1	CAP SMD0603 CERM 1.0ufd 10V 10% X5R ROHS	DIGI-KEY	TDK
3	06031C103JAT2A	1	C7	478-3700-1	CAP SMD0603 CERM 0.01ufd 25V,5% X7R ROHS	DIGI-KEY	AVX
4	06033D104KAT2A	2	C2, C10	478-1244-1	CAP SMD0603 CERM 0.1UFD 25V X5R ROHS	DIGI-KEY	AVX
5	C1206C106K4PACTU	1	C9	399-5091-1	CAP SMD1206 CERM 10UFD 16V 10% X5R ROHS	DIGI-KEY	KEMET
6	GRM21BR71A106KE51L	1	C1	490-3905-1	CAP SMD0805 CERM 10ufd 10V 10% X7R ROHS	DIGI-KEY	MURATA
7	ECJ-1VB1H102K	DNP	C13, C14	PCC1772CT	CAP SMD0603 CERM 1000PFD 50V 10% X7R ROHS	DIGI-KEY	PANASONIC
8	ECJ-1VB1H472K	2	C11, C12	PCC1780CT	CAP SMD0603 CERM 4700PFD 50V X7R ROHS	DIGI-KEY	PANASONIC
RESISTORS							
9	ERJ-6GEYJ102V	DNP	R3, R4	P1.0KACT	RESISTOR SMD0805 1.0K 5% 1/8W ROHS	DIGI-KEY	PANASONIC
10	ERJ-3GEYJ103V	2	R1, R2	P10KGCT	RESISTOR SMD0603 10K 5% 1/10W ROHS	DIGI-KEY	PANASONIC
11	ERJ-8ENF10R0	1	R5	P10.0FCT	RESISTOR SMD1206 10.0 OHM 1% 1/4W ROHS	DIGI-KEY	PANASONIC
INDUCTORS							
12	LPS4018-472MLB	1	L1	LPS4018-472MLB	SHIELDED POWER INDUCTOR 4.7uH,ROHS	COIL CRAFT	COIL CRAFT
13	LQH2MCN220K02L	1	L2	490-4048-1	INDUCTOR SMD0806 22uH 10% 185MA 30MHZ ROHS	DIGI-KEY	MURATA
HEADERS AND JACKS							
14	26630201RP2	1	JP1	2663S-02	HEADER 2 PIN, PCB 2.0MM ROHS	DIGI-KEY	NORCOMP
15	26630301RP2	1	GAIN	2663S-03	HEADER 3 PIN, PCB 2.0MM ROHS	DIGI-KEY	NORCOMP
16	PBC02SAAN	3	J1, J2, J3	S1011E-02	HEADER 2 PIN MALE, 0.100LS, PCB GOLD ROHS	DIGI-KEY	SULLINS
17	PJRAN1X1U01X	1	IN	65K7770	JACK, RCA 3-PIN PCB-RA BLACK ROHS	NEWARK	SWITCHCRAFT
TESTPOINTS AND SWITCHES							
18	5003	DNP	IN+, IN-, SD, SD-AMP, TP1, TP2, VCC	5003K	PC TESTPOINT, ORANGE, ROHS	DIGI-KEY	KEYSTONE
19	5001	1	GND	5001K	PC TESTPOINT, BLACK, ROHS	DIGI-KEY	KEYSTONE
20	TL1015AF160QG	2	S1, S2	EG4344CT	SWITCH, MOM, 160G SMT 4X3MM ROHS	DIGI-KEY	E-SWITCH

Table 1. BILL OF MATERIALS for TPA2100P1YZH_EVM (continued)

ITEM	MANUFACTURER PART NUM	QTY	REF DES	VENDOR PART NUM	DESCRIPTION	VENDOR	MANUFACTURER
BINDING POSTS							
21	111-2223-001	2	OUT+, OUT-	J587	BINDING-POST,NONINS,THRU,ROHS	DIGI-KEY	EMERSON NPCS
22	7007	1	VDD	7006K	BINDING POST, RED, 15A ECONO ROHS	DIGI-KEY	KEYSTONE
23	7006	1	GND	7007K	BINDING POST, BLACK, 15A ECONO ROHS	DIGI-KEY	KEYSTONE
SHUNTS							
24	800-002-SP2-001	2	JP1, GAIN	SP2-001	SHUNT, BLACK AU FLASH 2 MM	DIGI-KEY	NORCOMP INC.
STANDOFFS AND HARDWARE							
25	PMS 440 0025 PH	4	SO1-SO4	H342	4-40 SCREW, STEEL 0.250 IN	DIGI-KEY	BUILDING FASTENERS
26	2027	4	SO1-SO4	2027K	STANDOF ,4-40 0.5IN 3/16IN DIA ALUM RND F-F	DIGI-KEY	KEYSTONE

6 Addendum

This is a list of modification made to the TPA2100P1 EVM Rev. A and appearing on Rev. B. The modifications do not affect the performance of the board.

Modification	Description
RCA (Black)	Flipped vertically
D2	Relabeled IN-
D3	Relabeled IN+
IN+ Pad	Relabeled IN-
IN- Pad	Relabeled IN+

NOTE: This user's guide contains schematics and layouts for both Revision A and Revision B, so please use the document accordingly.

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of –0.3 V to 6 V and the output voltage range of –0.3 V to Vdd+3 V.

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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