

TPA6130A2EVM

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1 Introduction

1.1 Description

The TPA6130A2 is a stereo, capacitor-free headphone driver with I²C digital volume control. The TPA6130A2 has minimal quiescent current consumption, a flexible, 64-step, audio tapered volume control and channel independent enables and mutes.

1.2 TPA6130A2EVM Specifications

VDD	Supply voltage range	–0.3 V to 5.5 V
IDD	Supply current	0.5 A Maximum
PO	Continuous output power per channel, 16 Ω , V _{dd} = 5 V, THD + N = 1%	138 mW
RL	Minimum load impedance	16 Ω

2 Operation

The TPA6130A2EVM can be evaluated in a stand-alone mode or when connected to existing circuits with I²C controls.

2.1 Quick Start List for Stand-Alone Operation

A desktop or laptop with Windows™ XP installed is required in the stand-alone operation. Connect the EVM to a computer with a USB cable. A jumper allows the TPA6130A2 to receive power from either the USB or an external supply via banana plugs. The inputs accept standard RCA plugs. The output connection accepts standard 3.5 mm headphone plugs.

2.1.1 Software Installation Sequence

1. Insert the CD provided.
2. Unzip the files to a temporary folder.
3. Install TPA6130A2 software by executing setup.exe located in *TPA6130A2 Interface\Volume*.

Accept license agreement and defaults, and complete installation. Note: you can uninstall later with Add/Remove Programs. **It is unnecessary to repeat the steps in section 2.1.1, once the software is installed.**

2.1.2 Evaluation Module Preparations

1. Install shunt in jumper JP4; this sets the EEPROM in the EVM to the nonprogrammable mode.
2. Install shunts in jumpers JP5 and JP6 when single-ended audio inputs are used; this ties LINN and RINN to ground.
3. Install shunts in JP2 and JP3 as shown in [Figure 1](#). This sets the TPA6130A2 to accept I²C inputs from the EVM itself.

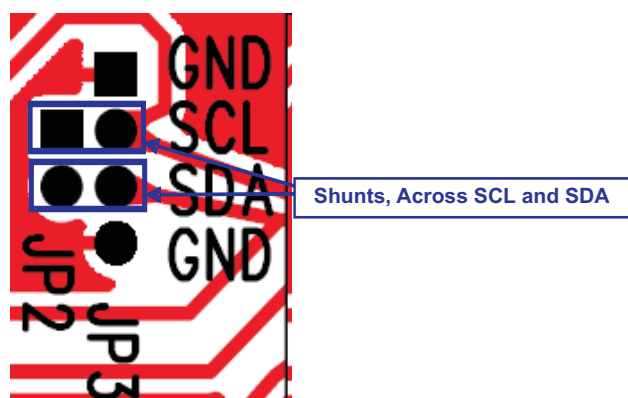


Figure 1. Place Shunts Horizontally Across SCL and SDA

4. TPA6130A2 can be powered either from the USB or with an external power supply.
 - a. To power TPA6130A2 from the USB, place shunt in JP1 as shown in [Figure 2](#).



Figure 2. Shunts Across JP1 Powered From USB

- b. To power TPA6130A2 from external power sources, place shunt in JP1 as shown in [Figure 3](#).



Figure 3. Shunts Across JP1 Powered With an External Power Supply

Ensure that all external power sources are set to OFF.

Connect an external regulated power supply adjusted from 2.5 V–6 V to the module VDD (**J8**) and GND (**J7**) banana jacks, taking care to observe marked polarity

5. Connect audio source to J4 and J3.
6. Connect headphones to J2.
7. Plug in USB. LED should light up.
8. If using external power sources, turn on. LED should light up.
9. If this is the first time you plug in a TPA6130A2EVM after installing the software, follow this set of Windows dialog, questions, and selections:
 - Can Windows connect to Windows Update to search for software?
No, not at this time -> Click Next
 - What do you want the wizard to do?
Install from a list or specific location (Advanced) -> Click Next
 - Search the best drivers in these locations
Un-check "Search removable media
Check "Include this location in the search:" -> Click Browse
Browse to the software install path (default: C:\Program Files\Texas Instruments Inc\TPA6130A2 Interface)
-> Click OK
-> Click Next
-> Click Finish
10. Proceed through installation. **It is not necessary to repeat steps 8 to 11, once the driver is installed.**

2.1.3 Using the Software

1. Start the TPA6130A2 Interface by clicking the *Start* menu and clicking on the *TPA6130A2 Interface* icon.

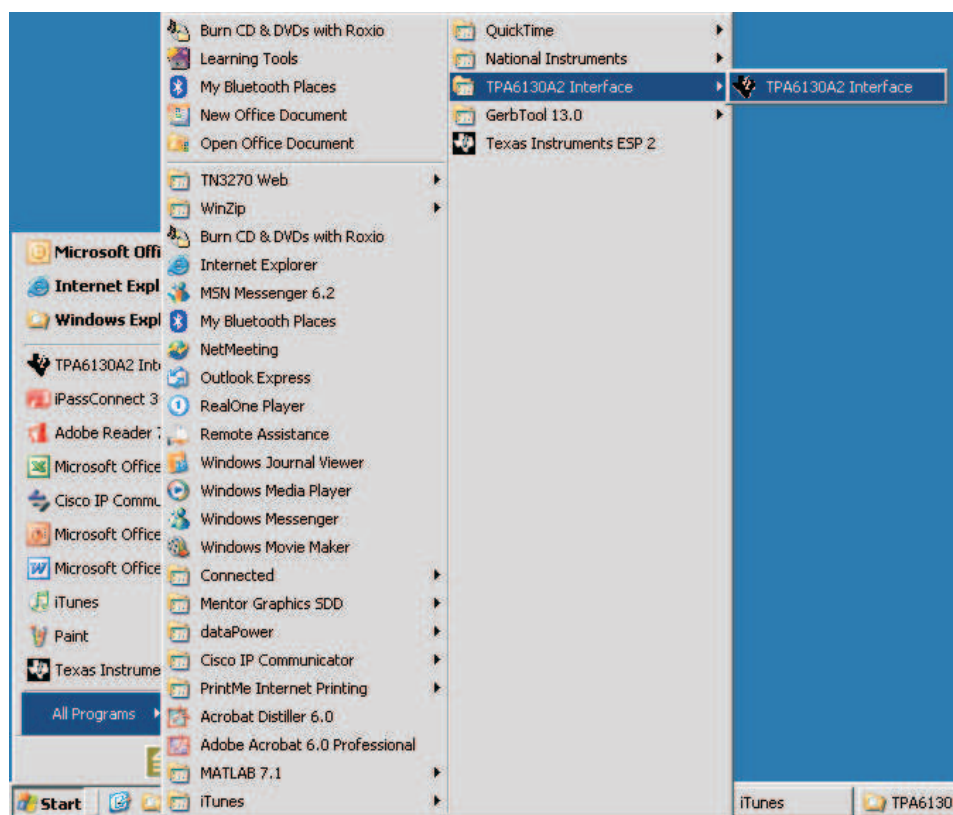


Figure 4. Starting the Software

- The TPA6130A2 software interface is as shown in Figure 5.

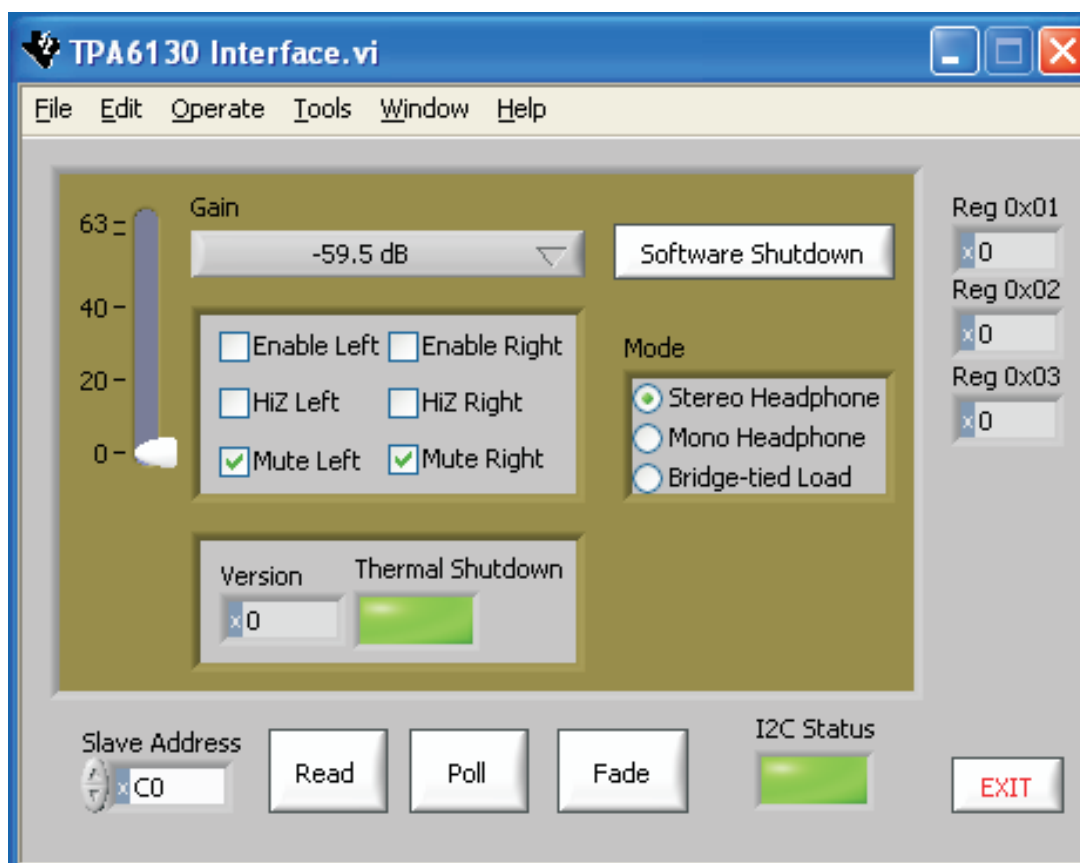


Figure 5. Software Interface

Note: The TPA6130A2 powers up with the amplifiers disabled, muted, and the gain set to the minimum. To hear an output, enable and unmute each channel, and set the gain to a higher level

- Follow these steps only if using a PC is both the music source and the computer on which the TPA6130A2 GUI is run.

When using WinXP, if, after initially installing the software, the PC does not play music out of the headphone jack:

- Open the Control Panel.
 - Click on Sounds, Speech, and Audio Device Link under the Control Panel.
 - Click on Sounds and Audio Device Properties link.
 - Click on the Audio tab.
 - Verify that the Default device under sound playback is the audio driver of the PC HW, not the USBMODEVM TPA6130A2 GUI driver.
 - Change the driver in the menu to the PC Audio HW driver.
 - Click on OK.
- Uncheck and check *Enable Left* or *Enable Right* to place the corresponding channels in and out of SHUTDOWN.
 - Check and uncheck *Mute Left* or *Mute Right* to place the corresponding channels in and out of MUTE.
 - Click *Software Shutdown* to place the TPA6130A2 in and out of SHUTDOWN.
 - Select the correct mode of output under *Mode*.
 - Adjust the Volume or Gain of the TPA6130A2 by dragging the *Gain* bar or clicking on the *Gain* display and selecting from the drop-down menu.

Operation

9. *I²C Status* box reports the status of I²C communications. An error or failure has occurred if it turns red.
10. *Thermal* box reports the status of thermal failure. A thermal fault has occurred if it turns red.

2.2 Quick Start List When Connected to Existing Circuits With I²C Controls

The TPA6130A2EVM can be easily connected to existing circuits with I²C controls. Connections to the EVM module can be made using banana plugs for the power supply. The inputs accept standard RCA plugs. The output connection accepts standard 3.5 mm headphone plugs.

2.2.1 Evaluation Module Preparations

1. Install shunts in jumpers JP4, JP5, and JP6. Remove shunts in JP2 and JP3 and connect I²C controls to JP3 as shown in [Figure 6](#).

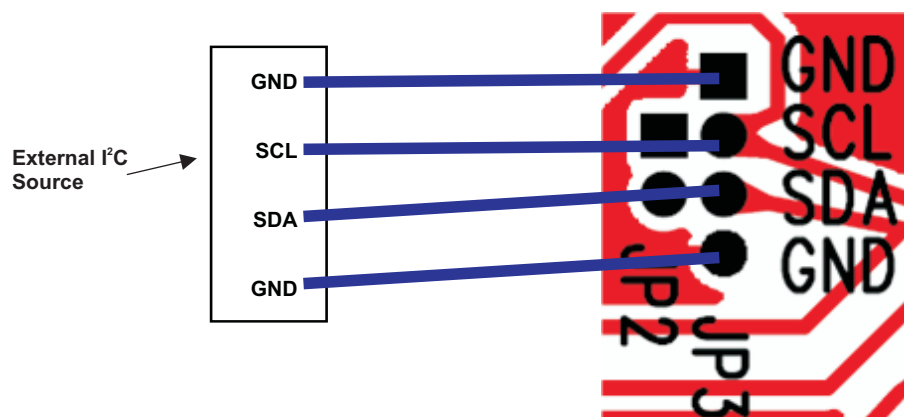


Figure 6. Connect I²C Controls to JP3

2. Power TPA6130A2 from external power sources; place shunt in JP1 as shown in [Figure 7](#).



Figure 7. Shunts Across JP1 Powered With an External Power Supply

Ensure that all external power sources are set to OFF.

Connect an external regulated power supply adjusted from 2.5 V–6 V to the module VDD (**J8**) and GND (**J7**) banana jacks, taking care to observe marked polarity

3. Connect audio source to J4 and J3.
4. Connect headphones to J2.
5. Set external power sources to ON. LED should illuminate.

3 TPA6130A2EVM Schematic

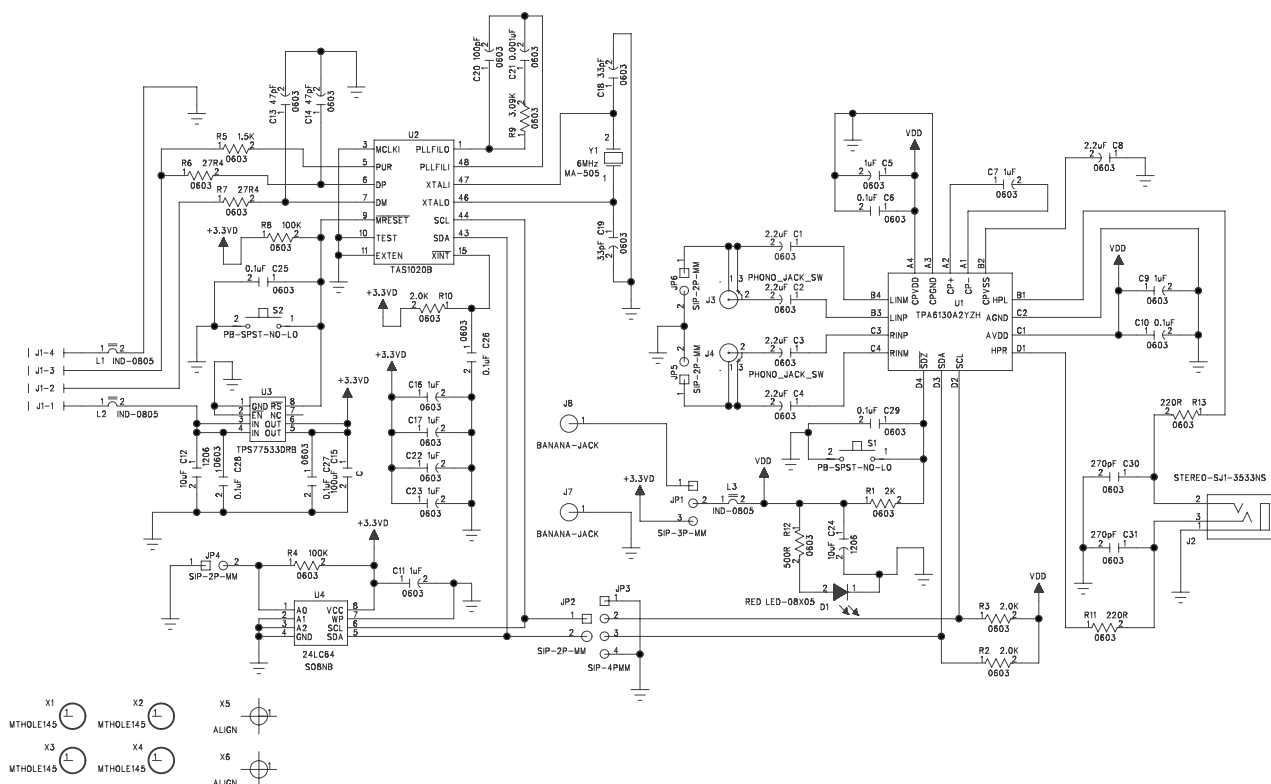


Figure 8. TPA6130A2EVM Schematic

4 TPA6130A2EVM PCB Layers

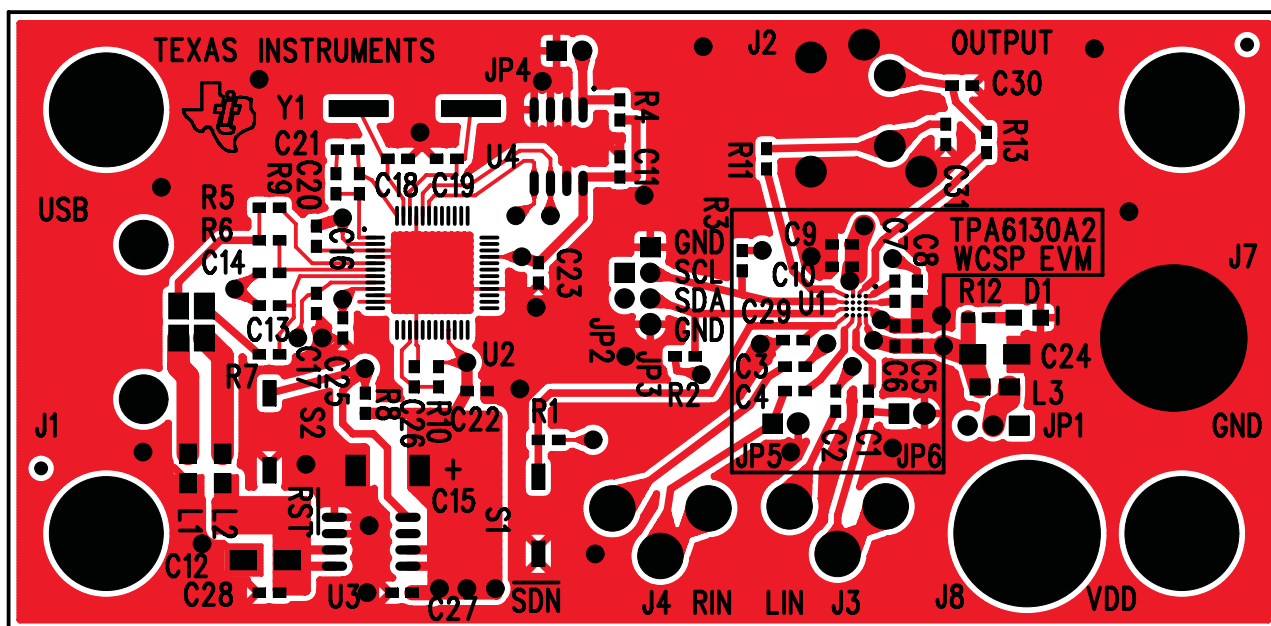


Figure 9. TPA6130A2EVM – Top Layer

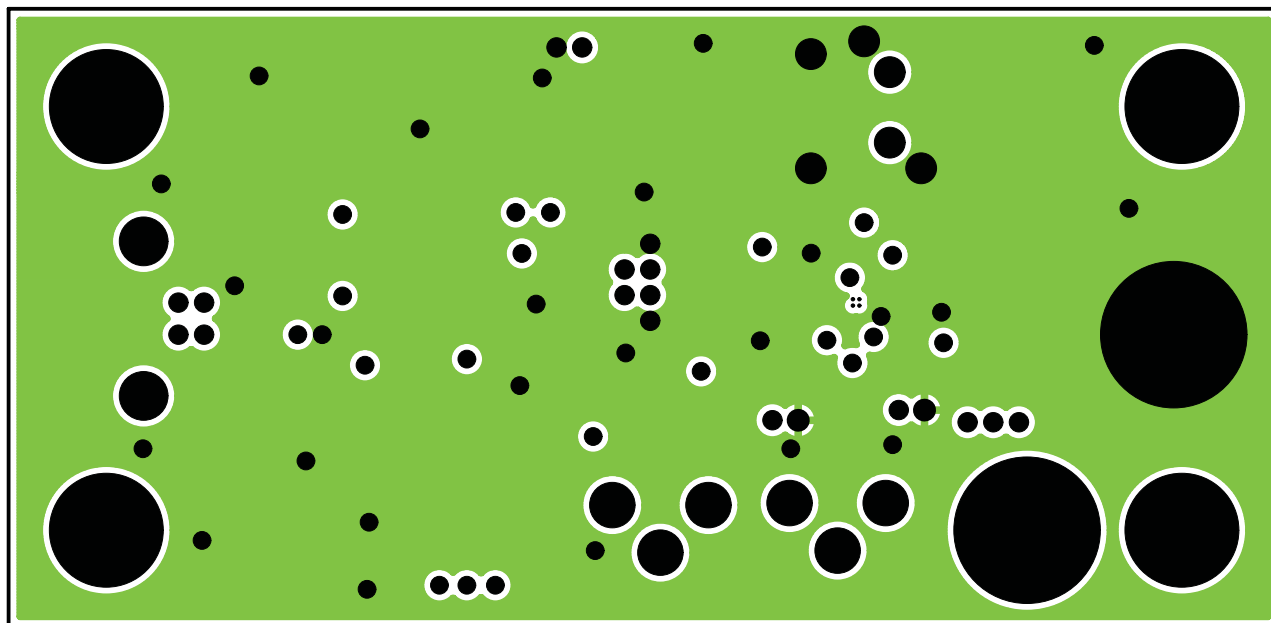


Figure 10. TPA6130A2EVM – Layer 2

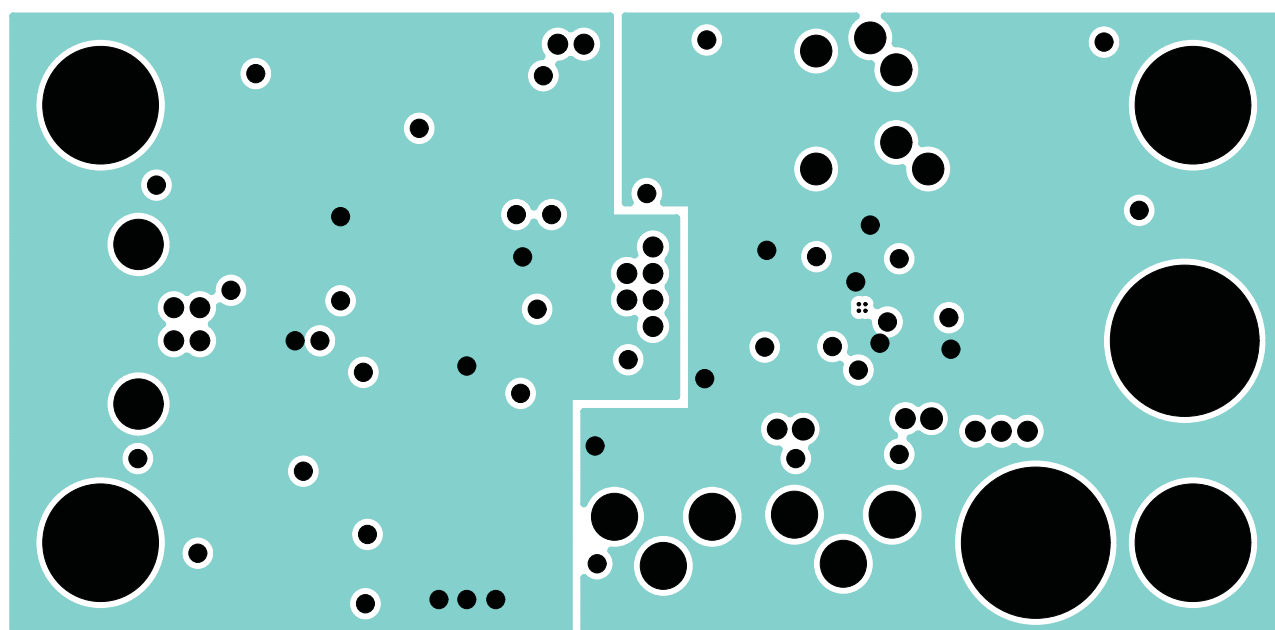


Figure 11. TPA6130A2EVM – Layer 3

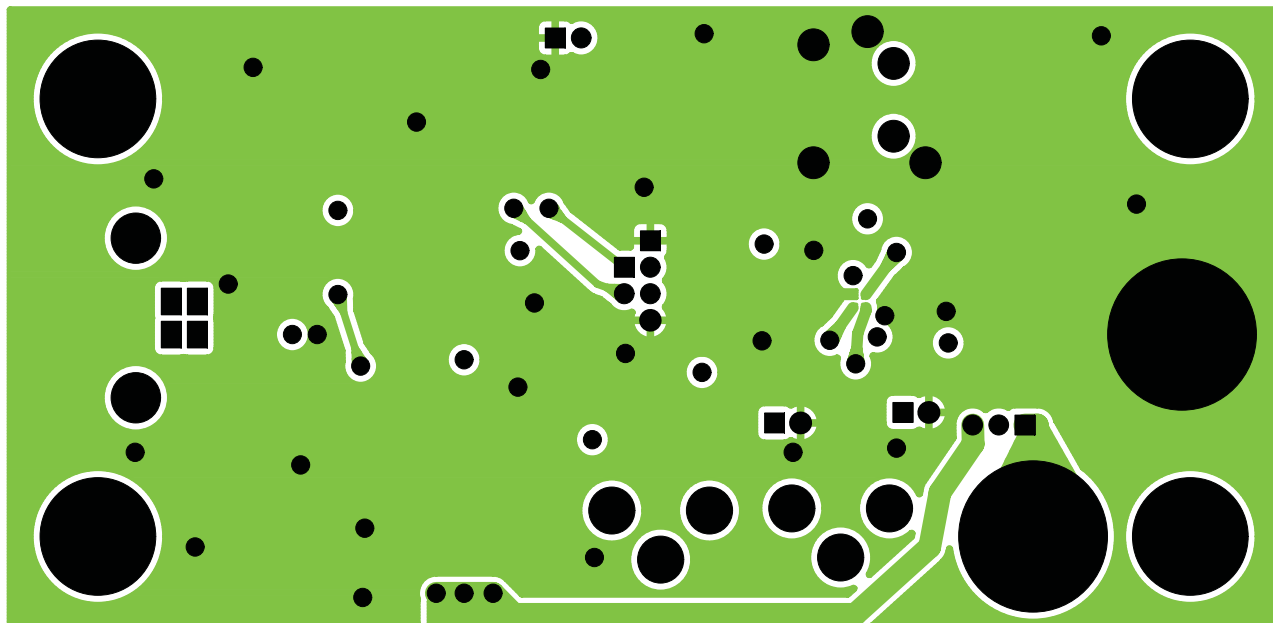


Figure 12. TPA6130A2EVM – Bottom Layer

5 TPA6130A2EVM Parts List

Table 1. TPA6130A2EVM Parts List

Reference	Description	Size	Qty	MFR/ Part No.	Vendor No.
C1, C2, C3, C4, C8	Capacitor, ceramic, 2.2 μ F, \pm 10%, X5R, 10 V	0603	5	Kemet C0603C225K8PACTU	Digi-Key 399-4911-1-ND
C5, C7, C9, C11, C16, C17, C22, C23	Capacitor, ceramic, 1.0 μ F, \pm 10%, X5R, 10 V	0603	8	TDK C1608X5R1A105KT	Digi-Key 445-1321-2-ND
C6, C10, C25, C26, C27, C28, C29	Capacitor, ceramic, 0.1 μ F, \pm 10%, X7R, 50 V	0603	7	TDK C1608X7R1H104KT	Digi-Key 445-1314-2-ND
C13, C14	Capacitor, ceramic, 47pF 50V C0G 5%	0603	2	TDK C1608C0G1H470J	Digi-Key 445-1277-2-ND
C12, C24	6.3V, 10 μ F, Ceramic Chip Capacitor, \pm 10%, X5R	1206	2	TDK C3216X5R0J106K	Digi-Key 445-1388-1-ND
C15	Tantalum Capacitor, 100 μ F, 10V, 10%, Low ESR, SMD	C	1	Kemet B45197A2107K309	DigiKey 495-1528-2-ND
C18, C19	50V, 33pF, Ceramic Chip Capacitor, \pm 5%, NPO	0603	2	TDK C1608C0G1H330J	DigiKey 445-1275-1-ND
C20	50V, 100pF, Ceramic Chip Capacitor, \pm 5%, NPO	0603	1	TDK C1608C0G1H101J	Digi-Key 445-1281-1-ND
C21	50V, 1000pF, Ceramic Chip Capacitor, \pm 5%, NPO	0603	1	TDK C1608C0G1H102J	Digi-Key 445-1293-1-ND
C30, C31	Multilayer Varistor Not Installed	0603	DNP	Little Fuse V14MLA0603	Mouser 576-V14MLA0603H
R1, R2, R3, R10	Resistor, chip, 2.7 k Ω , 1/10W, 5%	0603	4	Panasonic ERJ-3GEYJ272V	Digi-Key P2.7KGCT-ND
R4, R8	Resistor, chip, 100 k Ω , 1/16W, 5%	0603	2	Panasonic ERJ-3GEYJ104V	Digi-Key P100KGCT-ND

Table 1. TPA6130A2EVM Parts List (continued)

Reference	Description	Size	Qty	MFR/ Part No.	Vendor No.
R5	Resistor, chip, 1.5 k Ω , 1/10W, 5%	0603	1	Panasonic ERJ-3GEYJ152V	Digi-Key P1.5KGCT-ND
R6, R7	Resistor, chip, 27.4 Ω , 1/16W, 1%	0603	2	Panasonic ERJ-3EKF27R4V	Digi-Key P27.4HCT-ND
R9	Resistor, chip, 3.09 k Ω , 1/16W, 1%	0603	1	Panasonic ERJ-3EKF3091V	Digi-Key P3.09KHCT-ND
R11, R13	0-Ohm jumper, 1/10W, 5%	0603	2	Panasonic ERJ-3GEY0R00V	Digi-Key P0.0GCT-ND
R12	RES 110 Ω 1/10W 1% 0603 SMD	0603	1	Panasonic ERJ-3EKF1100V	Digi-Key P110HTR-ND
Y1	6MHz Crystal SMD		1	Epson MA-505 6.0000M-C0	Digi-Key SE2501CT-ND
S1, S2	Switch, momentary, SMD, low profile		2	Panasonic EVQ-PPBA25	Digi-Key P8086SCT-ND
L1, L2, L3	Inductor Bead	0805	3	Steward/HZ0805E601R-00 or Steward/HZ0805E601R-10	Digi-Key/240-1018-1-ND or Digi-Key/240-2399-1-ND
D1	Diode, LED, Green	0805	1	Lumex SML-LXT0805GW-TR	Digi-Key 67-1553-2
J1	USB Type B Slave Connector Thru-Hole		1	Mill-Max 897-30-004-90-000000	Digi-Key ED90003-ND
J2	Headphone Jack, shielded, 3.5mm		1	CUI SJ1-3533NS	Digi-Key CP1-3533NS-ND
J3, J4	Phono jack, PC mount, switched, red		2	Switchcraft PJRN1X1U03	Newark 16C1860
J7, J8	Banana Jack w/knurled Thumbnut (nickel plate)		2	Johnson 111-2223-001	Digi-Key J587-ND
JP1	Header, 3 position, male	2mm	1	Norcomp 2163-36-01-P2	DigiKey 2163S-36
JP2, JP4– JP6	Header, 2 position, male	2mm	4	Norcomp 2163-36-01-P2	DigiKey 2163S-36
JP3	Header, 4 position, male	2mm	1	Norcomp 2163-36-01-P2	DigiKey 2163S-36
JP1–JP6 (shunts)	SHUNT, 2mm	2mm	6	Specialty 2JM-G	
U1	Headphone amplifier with I ² C controls	WCSP	1	TI TPA6130A2	
U2	USB Streaming Controller		1	TI TAS1020BPFB	
U3	3.3V LDO Regulator with reset output		1	TI TPS77533DRB	
U4	64K 2-Wire Serial EEPROM I ² C		1	Microchip 24LC64I/SN	DigiKey 24LC64-I/SN-ND
	Standoffs, 5/8" length, 4-40 thread		4	Keystone 1808	(Newark) 89F1934
	Screws, 4-40, 0.375		4		(Digi-Key) H781-ND

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the supply voltage range of -0.3 V to 6 V and the input voltage range of -0.3 V to VDD +0.3 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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