

IS31AP2145A 2.9W@5V MONO CLIP-LESS & FILTER-LESS CLASS-D AUDIO POWER AMPLIFIER

DESCRIPTION

The IS31AP2145A is a 2.9W@5.0V mono, clip-less, filter-less, high efficiency Class-D audio power amplifier with automatic gain control.

The IS31AP2145A integrates an AGC (Automatic Gain Control) function to automatically prevent distortion of the audio signal by which we can enhance audio quality and also protect the speaker from damage at high power levels. The AGC function and its attack time/release time are selectable via the CTRL pin. The IS31AP2145A also provides thermal and over current protection functions.

The demo board has four modes (AGC1, AGC2, AGC OFF, and SHUTDOWN) to test the functionality of the IS31AP2145A.

FEATURES

- Operating from $V_{CC} = 2.7V \sim 5.5V$
- Filter-less Class-D architecture
- AGC enable/disable function
- 2.7W into 4Ω at 5.0V (10% THD+N)
- Minimum external components
- High efficiency: 90%
- Click-and-pop suppression
- Short-circuit and thermal protection
- Space-saving UTQFN-9, 1.5mm × 1.5mm

QUICK START

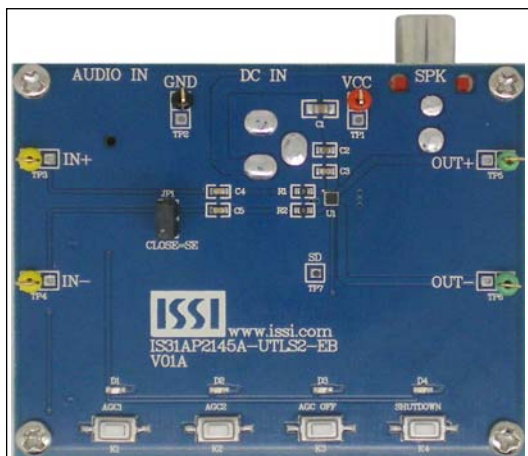


Figure 1: Photo of IS31AP2145A Evaluation Board

RECOMMENDED EQUIPMENT

- 5.0V, 2A power supply
- Audio source (i.e. MP3 player, Notebook PC, etc.)
- 8Ω or 4Ω speakers

ABSOLUTE MAXIMUM RATINGS

- $\leq 5.5V$ power supply

Caution: Do not exceed the conditions listed above, otherwise the board will be damaged.

PROCEDURE

The IS31AP2145A demo board is fully assembled and tested. Follow the steps below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

- 1) Connect a 4Ω (or larger) speaker across the OUT- terminal and OUT+ terminal or the RCA female connector (SPK CON3).
- 2) Connect the ground terminal of the power supply to the GND (TP2) and the positive terminal to the VCC (TP1). Or connect DC power to connector (DC IN) with a 2.5 mm jack.
- 3) If the audio source is differential, remove jumper JP1, connect the negative of the audio source to the IN- terminal, and connect the positive of the audio source to IN+ terminal.
- 4) If the audio source is single-ended, connect the audio source to the IN+ terminal, and close jumper JP1; or connect audio source to the audio mono connector (AUDIO IN) and close jumper JP1.

Turn on the power supply, and pay attention to the supply current. If it is over 1.5A, turn off power and check the evaluation board for short circuit connections.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31AP2145A-UTLS2-EB	-40°C ~ +85°C (Industrial)	UTQFN-9, Lead-free

Table 1: Ordering Information

For pricing, delivery, and ordering information, please contact ISSI's analog marketing team at analog@issi.com or (408) 969-6600.

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EVALUATION BOARD OPERATION

The IS31AP2145A demo board has an LPC922 MCU to read the status of the four buttons which select between the different modes shown in Table Co1 below. The current operating mode is indicated by the illuminated LED above the appropriate button. The default mode is AGC1 enabled.

Table 2 Mode settings

CTRL1	CTRL2	Mode
H	H	AGC1
H	GND	AGC2
GND	H	AGC OFF
GND	GND	Shutdown

See the IS31AP2145A datasheet for mode configuration details.

HIGH-PASS FILTER

The evaluation board's high-pass filter consists of the input capacitors C_{IN} (C_4 or C_5) and R_{IN} (IS31AP2145A internal resistance ($28.5k\Omega$) + (R_1 or R_2)). The filter's corner frequency, f_c , is determined by Equation (1).

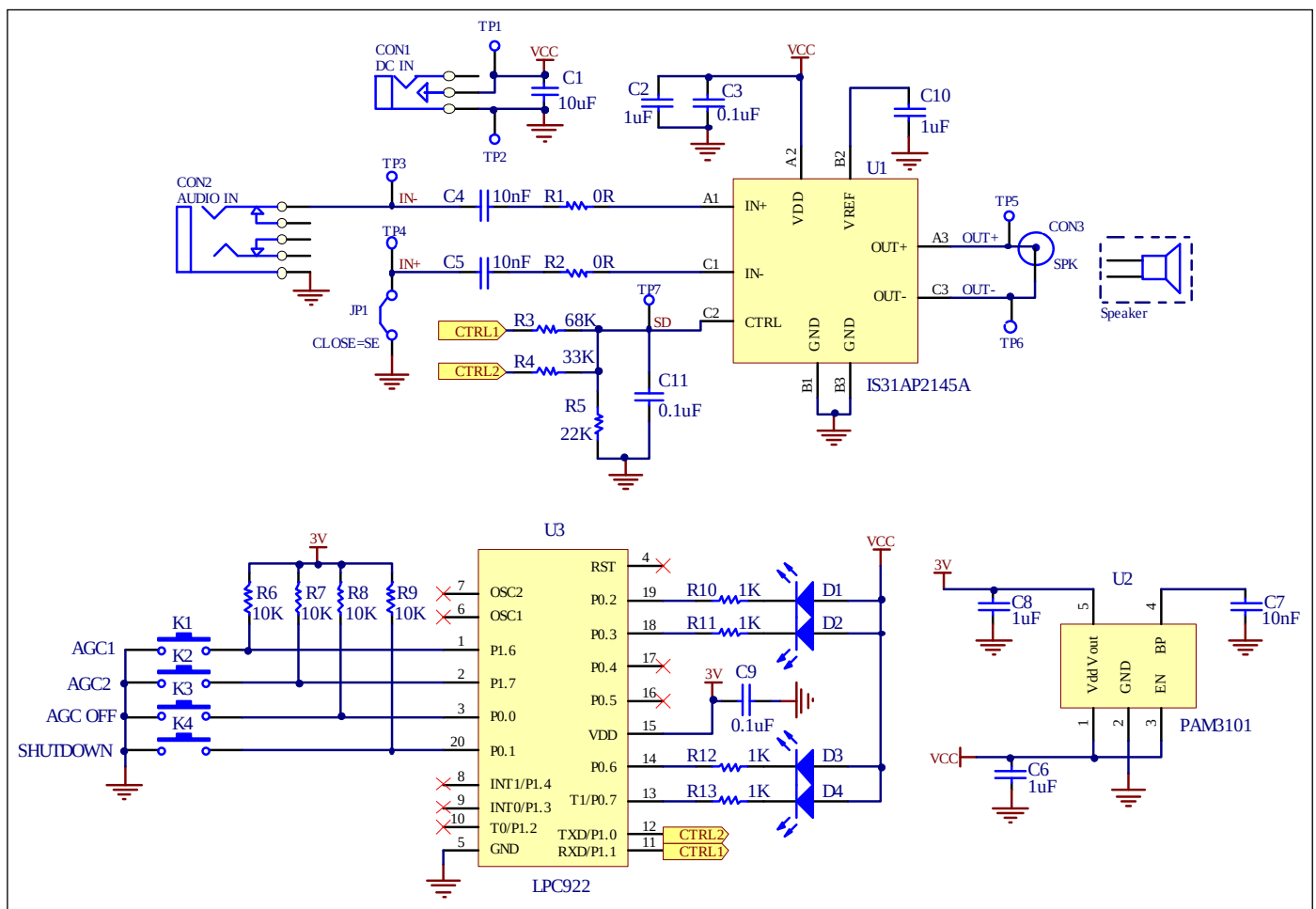
$$f_c = \frac{1}{(2\pi R_{IN} C_{IN})} \quad (1)$$

The corner frequency can be adjusted by replacing the R_1 or R_2 0Ω resistors with a larger resistor value or by increasing/decreasing the C_4 or C_5 capacitance.

SHUTDOWN MODE

The SHUTDOWN button selects the power-down mode of the IS31AP2145A.

Note: The IS31AP2145A Mode setting is controlled by the onboard LPC922 MCU.



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AUDIO POWER AMPLIFIER**



BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
Amplifier	U1	Class-D audio amplifier	1	ISSI	IS31AP2145A-UTLS2
LDO	U2	Low-dropout regulator	1	PAM	PAM3101
MCU	U3	Microcontroller	1	NXP	LPC922
LED	D1~D4	LEDs Blue, SMD	4	Everlight	19-217/BHC-ZL1M2RY/3T
Resistor	R1, R2	RES,0R,1/16W,±5%,SMD	2	Yageo	RL0603FR-0700KL
Resistor	R3	RES,68K,1/16W,±1%,SMD	1	Yageo	RC0603FR-0768KL
Resistor	R4	RES,33K,1/16W,±1%,SMD	1	Yageo	RC0603FR-0733KL
Resistor	R5	RES,22K,1/16W,±1%,SMD	1	Yageo	RC0603FR-0722KL
Resistor	R6~R9	RES,10K,1/16W,±5%,SMD	4	Yageo	RC0603JR-0710KL
Resistor	R10~R13	RES,1K,1/16W,±5%,SMD	4	Yageo	RC0603JR-071KL
Capacitor	C1	CAP,10μF,10V,±10%,SMD	1	Yageo	CC0805KRX7R6BB106
Capacitor	C2, C10	CAP,1μF,50V,±10%,SMD	2	Yageo	CC0603KRX7R9BB105
Capacitor	C3, C9,C11	CAP,0.1μF,50V,±10%,SMD	3	Yageo	CC0603KRX7R9BB104
Capacitor	C4, C5, C7	CAP,10nF,50V,±10%,SMD	3	Yageo	CC0603KRX7R9BB103
Capacitor	C6, C8	CAP,1μF,25V,±10%,SMD	2	Yageo	CC0805KRX7R8BB105
Button	K1~K4	Button SMD	4		
Connector	DC IN	2.5mm DC connector	1		
Connector	SPK	RCA type plugs	1		
Connector	AUDIO IN	3.5mm min plug	1		
TP1~TP7	TP1~TP7	Test pins	7		

Bill of materials refers to Figure 2 above.

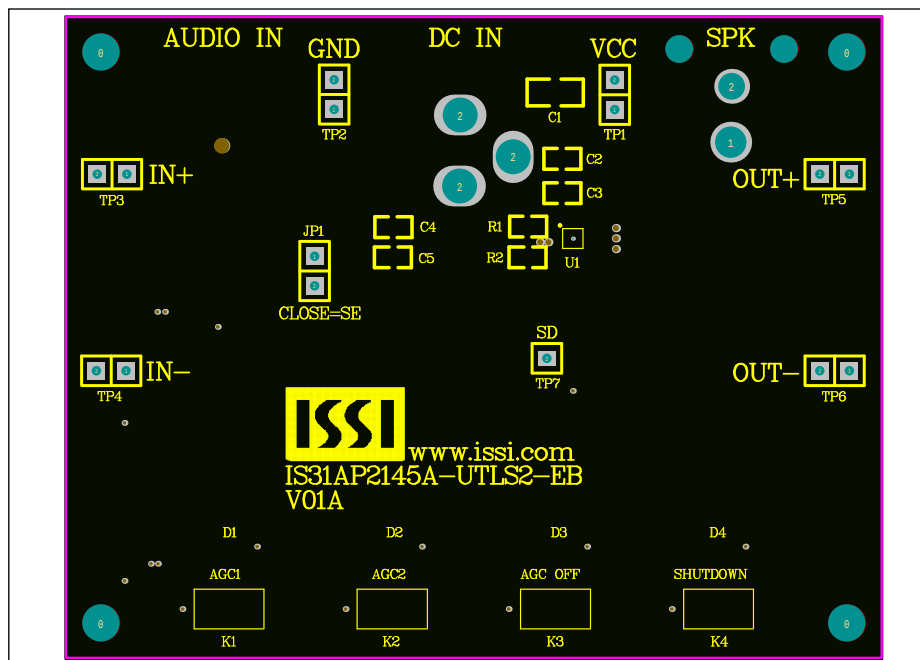


Figure 3: Board Component Placement Guide - Top Layer

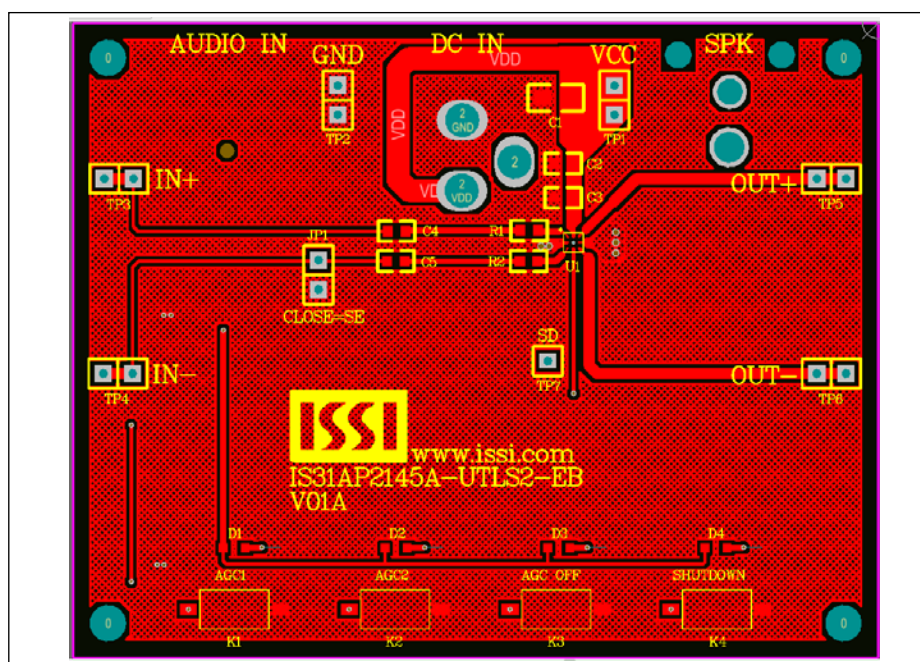


Figure 4: Board PCB Layout - Top Layer

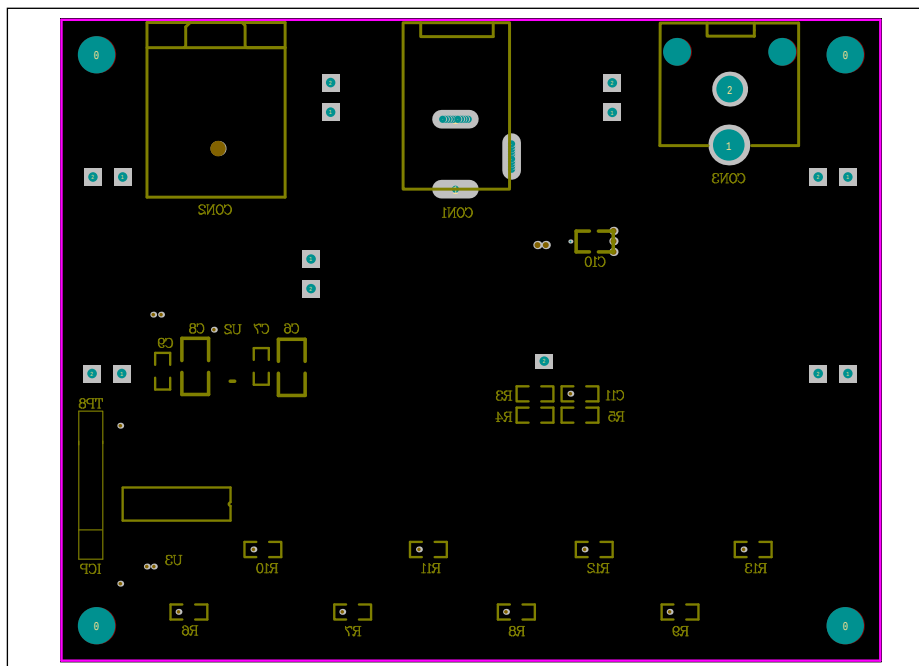


Figure 5: Board Component Placement Guide - Bottom Layer

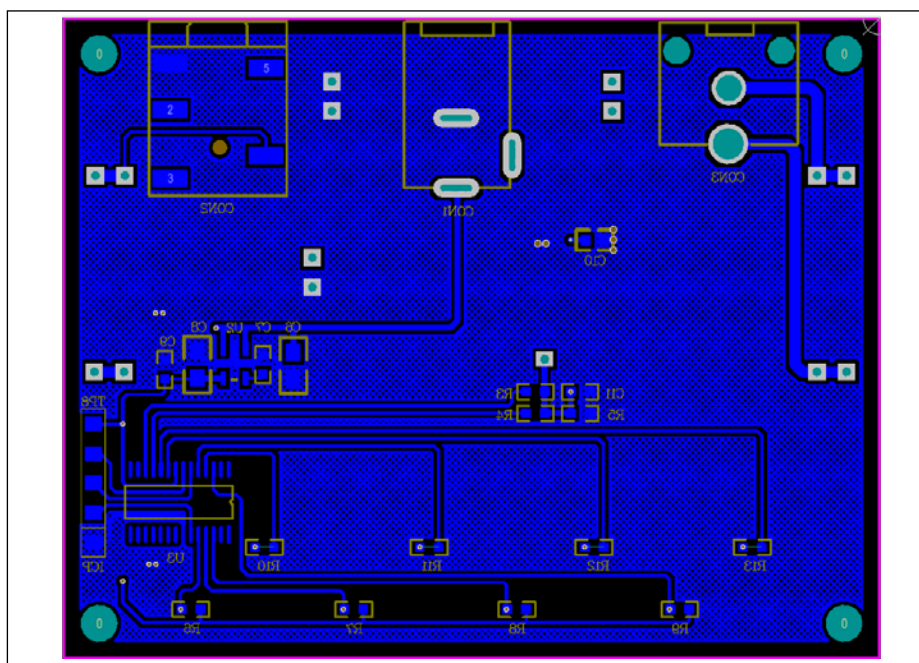


Figure 6: Board PCB Layout - Bottom Layer

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