GENERAL DESCRIPTION

The XPT9305 is an audio power amplifier primarily designed for demanding applications in low-power portable systems. It is capable of delivering 5 watts of continuous average power to a 2Ω BTL load with less than 10% distortion (THD) from a 5V DC power supply.

XPT9305 features a low-power consumption shutdown mode.

The XPT9305 contains advanced pop & click circuitry which eliminates noise which would otherwise occur during turn-on and turn-off transitions.

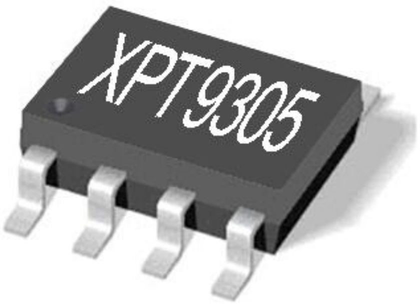
The XPT9305 can be configured by external gain-setting resistors.

The XPT9305 integrates overheating protection mechanism. The XPT9305 is unity-gain stable and can be configured by external gain-setting resistors.

FEATURES

- Fully-differential class D audio power amplifier
- Available in space-saving packages: ESOP8
- 5W Output Power (10% THD, 2Ω load, 5V)
- Wide operating voltage range: 2V~5.5V
- Improved pop & click circuitry eliminates noise during turn-on and turn-off transitions

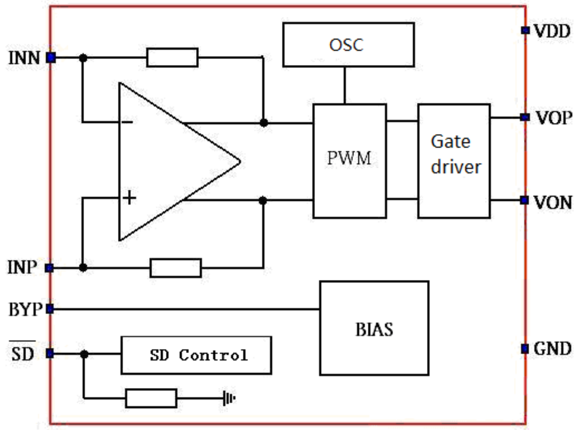
THE PHYSICAL MAP



APPLICATIONS

- Card inserting speaker, Bluetooth speaker, Mobile phone
- Low voltage audio system,USB,2.1/2.0 multimedia
- Radio
- MP3/MP4/MP5/CD
- Digital camera
- Tablet PC, Handheld game machine

BLOCK DIAGRAM



Address：The 5th floor, R3-A, hi tech Industrial Park, Nanshan District, Shenzhen, Guangdong Prov. China
Website：www.xptek.cn The Micro message No.：**szxpt168**
Sales：sales@xptek.cn Technical support：support@xptek.cn Design services：design@xptek.cn

ORDERING INFORMATION

PART NUMBER	PACKAGE TYPE	SHIPPING PACKAGE（PCS）	NOTE
XPT9305	ESOP8	100 Units/Tube	Thermal PAD

TYPICAL APPLICATION CIRCUIT

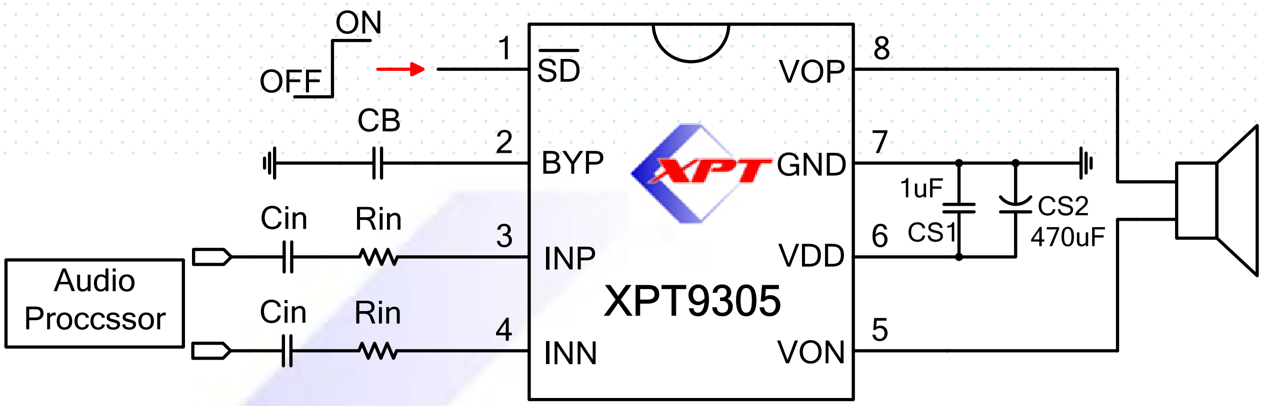


Figure1. Typical Application Circuit

PIN CONFIGURATION

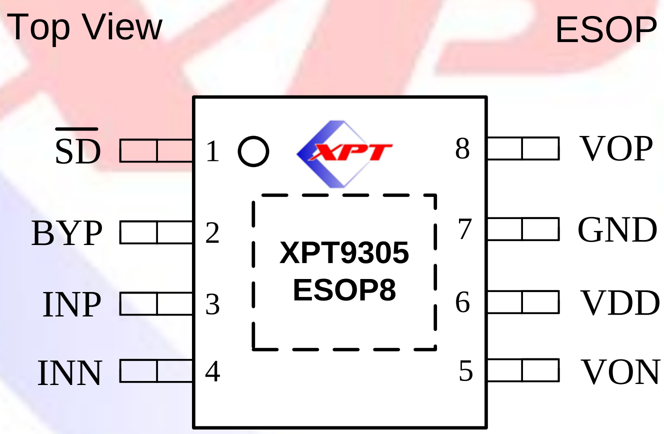


Figure2.Pin Configuration

PIN DESCRIPTION

PIN NUMBER	PIN NAME	PIN DESCRIPTION
1	SD	Shutdown Control Input(active low)
2	BYP	Internal common-mode voltage
3	INP	The positive phase Input
4	INN	The negative phase Input
5	VON	The negative phase output
6	VDD	Power
7	GND	Ground
8	VOP	The positive phase output

PCB DESIGN CONSIDERATIONS

1. Place wide power line alone to the XPT9305, the width of the copper wire is about 0.75mm. the decoupling capacitors should be placed near to the power supply pin as close as possible;
2. The input capacitance and the input resistanor of the XPT9305 should be placed to the INN pin and the INP pin as close as possible.
3. The ferrite beads and the capacitor should be placed close to the the VOP pin and the VON pin, the line to the output should be short and thick, and the recommended width of the wire is 0.5mm;
4. In order to obtain a good heat dissipation performance, The XPT9305's heat sink and GND pins should be connected directly to the ground with large area, the heat sink should be connected to the intermediate ground through the vias.

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	VALUE	UNITS
VDD	Supply Voltage	1.8 to 6.0	V
$V_{\overline{SD}}$	Shutdown Control Input Voltage	-0.3 to VDD+0.3	V
T_A	Operating Ambient Temperature	-40 to 85	°C
T_J	Junction Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-65 to 150	°C
	Lead Temperature (Soldering, 10 sec)	220	°C

RECOMMENDED OPERATING CONDICTIONS

SYMBOL	PARAMETER	MIN	MAX	UNITS
VDD	Supply Voltage	2.0	5.5	V
V_{IH}	High-level input voltage	1.5	VDD	V
V_{IL}	Low-level input voltage		1.2	V
T_A	Operating Ambient Temperature	-40	85	°C

ELECTRICAL CHARACTERISTICS

Chip characteristics TA = 25°C (Unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNITS
VDD	Supply Voltage			2.0		5.5	V
I_Q	Quiescent Current	No Load			6		mA
$I_{\overline{SD}}$	Shutdown Current	VDD=5V			1		μA
V_{OS}	Output Offset Voltage	Vin=0V, VDD=5V			10		mV
F_{SW}	Switching Frequency	VDD=2.5V to 5.5V			360		KHz
P_O	Output Power	THD+N＝1%，f=1KHz，RL=4Ω	VDD=5.0V		2		W
			VDD=4.2V		1.6		

			VDD=3.7V		1.2		
		THD+N＝10%，f=1KHz，RL=4Ω	VDD=5.0V		3		
			VDD=4.2V		2.1		
			VDD=3.7V		1.7		
		THD+N＝1%，f=1KHz，RL=2Ω	VDD=5.0V		3.5		
			VDD=4.2V		2.3		
			VDD=3.7V		1.8		
		THD+N＝10%，f=1KHz，RL=2Ω	VDD=5.0V		5		
			VDD=4.2V		3.3		
			VDD=3.7V		2.6		
THD+N	Total Harmonic Distortion Plus Noise	AVD=2，20Hz≤f≤20KHz，RL=4Ω，P_O=0.5W			0.5		%
PSRR	Power Supply Ripple	VDD＝4.9V to 5.1V		65	80		dB

APPLICATION INFORMATION

INPUT RESISTANCE (Ri) SELECTION

The XPT9305 contains two stage gains, the first stage gain can be configured by an external input resistor, and the second stage gain is the internal fixation. By choosing the input resistance value can set the gain of the amplifier:

$$Gain = \frac{2 \times 100K\Omega}{3K\Omega + Ri} \quad (1)$$

Any mismatch between the resistors results in a differential gain error that leads to an increase in THD+N, decrease in PSRR and CMRR, as well as an increase in output offset voltage. Resistors with a tolerance of 1% or better are recommended. The gain setting resistors should be placed as close to the device as possible. Keeping the input traces close together and of the same length increases noise rejection in noisy environments. Noise coupled onto the input traces which are physically close to each other will be common mode and easily rejected. Low gain and high voltage signal can make the chip performance more prominent.

DECOUPLING CAPACITOR(Cs)

XPT9305 is a high performance audio power amplifier, it needs for proper power supply decoupling to ensure its high efficiency and low harmonic distortion. Decoupling capacitor with low impedance ceramic capacitor, as close to the chip power supply pin, because any resistor, capacitor and inductor are likely to affect the efficiency of power conversion. A 220uF or larger capacitors placed near the power supply will get better filter effect.

INPUT CAPACITOR(Ci) SELECTION

In the typical application, an input capacitor (Ci) is required to allow the amplifier to bias the input signal to the proper dc level for optimum operation. In this case, Ci and the input impedance of the amplifier form a high-pass filter with the corner frequency determined in Equation 2.

$$f_c = \frac{1}{2\pi RiCi} \tag{2}$$

The value of Ci is important, as it directly affects the bass (low-frequency) performance of the circuit. Consider the example where Zi is 20kΩ and the specification calls for a flat bass response down to 20Hz. Equation 2 is reconfigured as Equation 3.

$$Ci = \frac{1}{2\pi Rifc} \tag{3}$$

In this example, Ci is 0.39nF, so one would likely choose a value in the range of 0.39μF to 0.47μF. A further consideration for this capacitor is the leakage path from the input source through the input network (Ci) and the feedback network to the load. This leakage current creates a dc offset voltage at the input to the amplifier that reduces useful headroom, especially in high gain applications. For this reason, a low-leakage tantalum or ceramic capacitor is the best choice. When polarized capacitors are used, the positive side of the capacitor should face the amplifier input in most applications as the dc level there is held at VDD/2, which is likely higher than the source dc level. Note that it is important to confirm the capacitor polarity in the application.

BYPASS CAPACITOR(CB) SELECTION

In the application of XPT9305 in the circuit, the other capacitor CB (connected to the BYP pin) is very crucial. CB will affect PSRR, switch / switching noise performance. Generally, the capacitance of the ceramic capacitor CB is 0.1uF ~ 1uF.

In addition to minimize the input and output capacitor size, bypass capacitor size should also be considered in detail. Bypass capacitor CB is minimized noise is the most important component, which determines the speed and the output opening to static DC voltage (usually supply the midpoint voltage1/2VDD) process, the process is slow, open the noise smaller. Select the 1.0uF CB and a small Ci (in the 0.033uF ~ 0.1uF) will achieve virtually no noise shutdown function. In the device functions normally (without oscillations or pop-click) and CB 0.1uF, the device will be more affected by the opening of noise. Therefore, in all except the highest cost sensitive design is recommended in 1.0uF or larger CB.

OUTPUT FILTER

Design the XPT9305 without the filter if the traces from amplifier to speaker are short (<10cm). Most applications require a ferrite bead filter. The ferrite filter reduces EMI around 1MHz and higher (FCC and CE only test radiated emissions greater than 30MHz).When selecting a ferrite bead, choose one with high impedance at high frequencies, but low impedance at low frequencies. Use an LC output filter if there are low frequency (<1MHz) EMI-sensitive circuits and/or there are long wires from the amplifier to the speaker. When both an LC filter and a ferrite bead filter are used, the LC filter should be placed as close as possible to the IC followed by the ferrite bead filter.

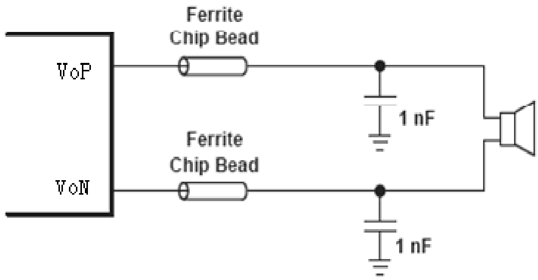


Figure3.Typical Ferrite Chip Bead Filter

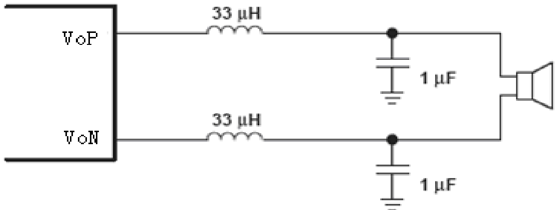
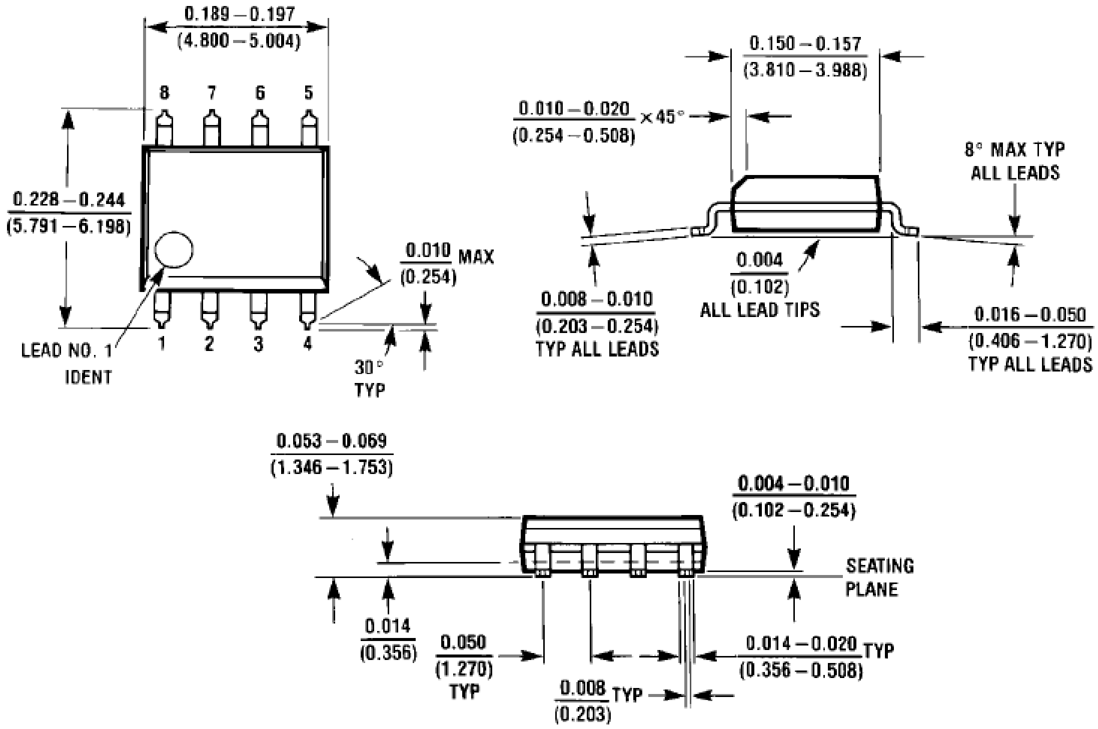


Figure4.Typical LC Output Filter, Cutoff Frequency of 28 kHz

PACKAGE INFORMATION

ESOP8



IMPORTANT NOTICE

SHENZHEN XPTEK TECHNOLGY CO., LTD

XPTEK reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.