TSTHX88 THX AAA™ Catalyst Headphone Amplifier
Product Brief

Description

Triad Semiconductor's TSTHX88 is an ultra-low noise, low quiescent current stereo headphone amplifier optimized for audiophile-quality performance in portable consumer applications. The device incorporates the ultra-low distortion Achromatic Audio Amplifier from THX® Technology (THX AAA™) to virtually eliminate crossover distortion and deliver superior THD and SNR at all output levels. The Class-G architecture maximizes battery life by automatically varying the supply voltage of the headphone amplifier based on the audio signal level. The ground-centered, "Capless" output implementation eliminates the need for large external DC-blocking capacitors between the audio amplifiers and the headphone loads to save board area, reduce cost, and improve low frequency audio fidelity.

The headphone amplifier features fully differential inputs with integrated low pass filtering to reduce system noise. Built-in active suppression eliminates clicks and pops as the amplifier is powered up and down. The amplifier outputs have robust short-circuit, thermal overload, and ESD protection.

The TSTHX88 is available in a tiny 25-bump wafer level chip scale package (WLCSP, 2.4mm x 2.4mm, 0.4mm pitch). The device operates from a 2.5V to 5.5V supply input and is specified over the -40°C to +85°C extended temperature range.

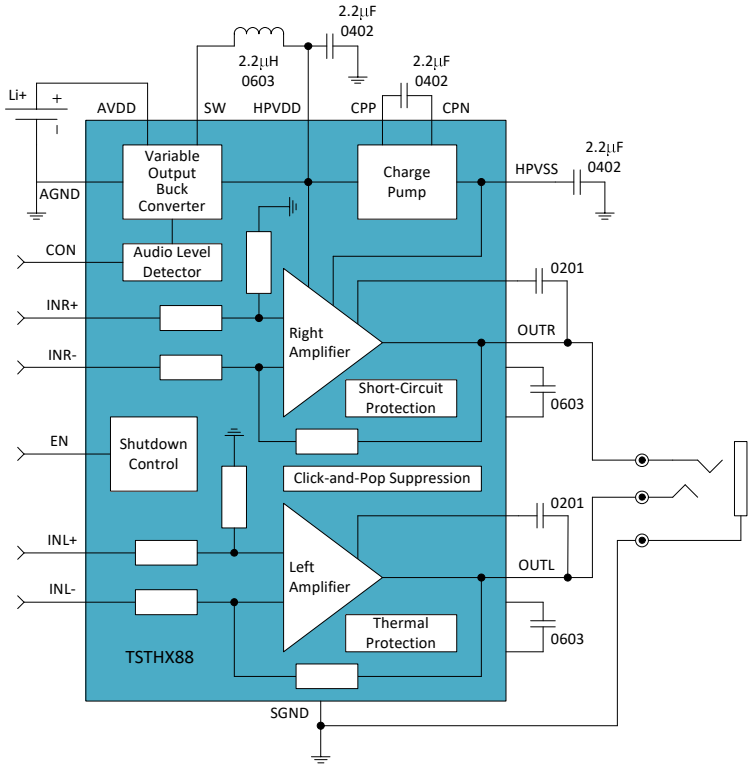
Applications

- Cellular Phones, Smart Phones, Music Phones
- Bluetooth Wireless Headphones
- Digital Audio Headphones
- Noise Cancelling Headphones
- Virtual Reality Headsets
- MP3 and Portable Media Players
- Tablets, Notebook PCs, Docking Stations

TSTHX88 Device Size
2.4mm x 2.4mm

Features

- **Ultra-Low Distortion THX AAA™ Amplifier**
- Ultra-Low Output Voltage Noise
- Low Quiescent Current
- High Efficiency Buck Regulator with Automatic Class-G Amplifier Supply Voltage Control
- Ground Referenced "Capless" Outputs Eliminate External DC-Blocking Capacitors
- Fully Differential Analog Inputs for Reduced System Noise (can be operated as Single-Ended)
- Ground Sense Pin Eliminates Ground Loop Noise
- Shutdown and Level Detect Logic Control
- Click-and-Pop Suppression
- Robust Short-Circuit, Thermal Overload, and ESD Protection
- Wide AVDD Input Supply Voltage Operating Range: 2.5V to 5.5V
- Inductor-Less Class-AB Operating Mode for Higher Output Voltages
- 25-Bump, 2.4mm x 2.4mm, 0.4mm pitch WLCSP Package



Simplified Application Circuit

Performance Characteristics

Absolute Maximum Ratings

Parameter	Notes/Conditions	MIN	MAX	units
AVDD		-0.3	6.0	V

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted).

Parameter	Notes/Conditions	MIN	TYP	MAX	units
AVDD	Supply voltage	2.5		5.5	V
T_{AMB}	Operating temperature range	-40		85	°C

Electrical Characteristics

Operating conditions: AVDD = 3.6 V, T_{AMB} = 25 °C, R_L = 32 Ω unless otherwise noted.

Parameter	Notes/Conditions		MIN	TYP	MAX	units
Power Supply						
I_Q	Quiescent Current	AVDD = 3.6 V, power supplies and amplifiers active, no input signal		1		mA
$I_{SHUTDOWN}$	Shutdown Current			1		µA
Batt	Battery Capacity	Li-ion battery size for 12 hrs play time, 12dB crest factor pink noise		32		mAh
Audio						
P_O	Output Power Per Channel (Outputs in Phase)	AVDD = 2.7 V, THD < 1%, f_{AUD} = 1 kHz, R_L = 16 Ω		63		mW
		AVDD = 2.7 V, THD < 1%, f_{AUD} = 1 kHz, R_L = 32 Ω		45		
V_O	Output Voltage	HPVDD = 3.6 V, THD < 1%, f_{AUD} = 1 kHz, R_L = 300 Ω		2.2		Vrms
THD	Total Harmonic Distortion	P_O = 40 mW, f_{AUD} = 1 kHz, R_L = 16 Ω		0.0001		%
				-120		dB
		P_O = 31 mW, f_{AUD} = 1 kHz, R_L = 32 Ω		0.00005		%
				-126		dB
		HPVDD = 3.6 V, Vo = 1.6 Vrms, f_{AUD} = 1 kHz, R_L = 300 Ω		0.00005		%
				-126		dB
THD+N	Total Harmonic Distortion plus Noise	P_O = 40 mW, f_{AUD} = 1 kHz, R_L = 16 Ω		0.0003		%
				-113		dB
		P_O = 31 mW, f_{AUD} = 1 kHz, R_L = 32 Ω		0.0002		%
				-115		dB
		HPVDD = 3.6 V, Vo = 2 Vrms, f_{AUD} = 1 kHz, R_L = 300 Ω		0.0001		%
				-121		dB
V_N	Output Noise Voltage	A-Weight		1.6		µVrms
SNR	Signal-to-Noise Ratio	A-Weight, 1% clipping distortion, f_{AUD} = 1 kHz, R_L = 32 Ω		118		dB
		HPVDD = 3.6V, A-Weight, 1% clipping distortion, f_{AUD} = 1 kHz, R_L = 300 Ω		122		

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