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# Audio solution guide
# Analog audio ICs



# Analog audio solution

## STMicroelectronics offers smart analog audio solutions for all audio equipment

Leveraging its long experience in audio devices, ST offers an analog audio device portfolio covering all audio segments from a few milliwatts up to hundreds of watts. ST's portfolio offers portables, home systems and TVs a smart and reliable design resource with outstanding audio quality that takes into account the needs of the most innovative and up-to-date audio equipment.

This brochure includes a selection guide for all of ST's analog audio ICs, audio processors and power amplifiers operating in class AB and class D. A section is dedicated to low-power amplifiers specifically designed for portable and headphone applications.

### ANALOG AUDIO ADVANTAGES

You will find what you are looking for in ST's analog audio ICs portfolio to meet the needs of your particular application. Here we discuss the different aspects of the different technologies available.

### CLASS-AB AMPLIFIERS

Analog audio ICs using the traditional class-AB operating mode still offer specific advantages in many applications. We can summarize these as follows:

- Excellent audio quality
- Reliability
- Simplicity of use
- Fast implementation reducing time to market
- No EMI issues
- No interference in multichannel equipment
- Low cost due to the reduced BOM
- Output power from a few mW up to 100 W per channel

The reduced efficiency versus class-D audio amplifiers is the only drawback for the final application but this issue in most home-audio applications is not necessarily that important.

### ANALOG AUDIO ICS

- Power amplifiers
- Analog class AB
- Analog class D
- Low power
- Headphones and portables
- Audio processors
- Analog

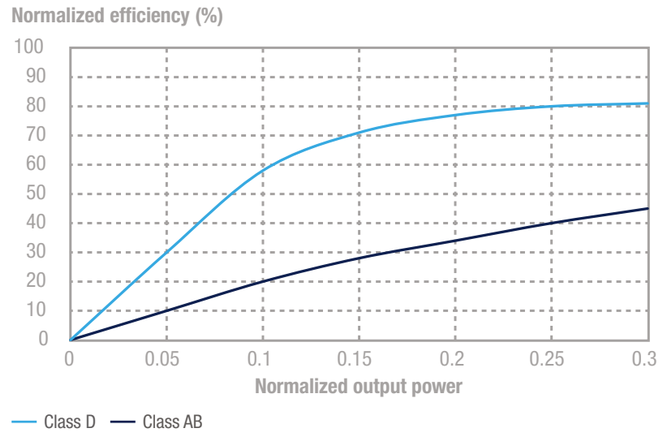


### CLASS-D AMPLIFIERS

Analog audio ICs using class-D operating mode are the recommended solution in applications where available space and efficiency are the main constraints, as is the case for portables and flat panel TVs, for example.
The higher efficiency offered by class-D solutions extends battery life in portable equipment, reduces the heatsink dimensions or eliminates it completely for the devices assembled in packages that use the PCB copper area as dissipating element.

ST's class-D portfolio gives you a wide choice of devices to meet the specific needs of your particular application, including from portables, active speakers, TVs and home systems. Our class-D amplifiers feature:

- High efficiency
- Differential inputs for common mode noise reduction
- Filterless operation
- Fixed selectable gains
- Externally synchronizable
- Output power from a few mW up to 200W per channel






## ANALOG AUDIO PROCESSORS

Analog audio processors are designed to control more advanced features on home audio systems, such as tone controls, surround mode, voice canceller, input and output multiplexers, bass boost, bass ALC and headphone driving capability.
Data transmission between the main application microprocessor and the audio processor is via a 2-wire I²C bus interface.

| Part number | Number of stereo inputs | Tone control | Surround modes | Volume control | Speaker attenuation | Supply voltage min/max (V) | Packages |
|---|---|---|---|---|---|---|---|
| **TDA7430** | 4 | 3 | 3 | | • | 7/10.2 | TQFP44 |
| **TDA7439DS** | 4 | 3 | | • | • | 7/10.2 | SO28 |
| **TDA7440D** | 4 | 2 | | • | • | 6/10.2 | SO28 |
| **TDA7448** | 6 mono | | | • | | 4.75/10 | SO20 |
| **TDA7468D** | 4 | 2 | | • | • | 5/10 | SO28 |
| **TDA7309D** | 3 | | | • | | 6/10 | SO20 |

## CLASS-AB ANALOG AMPLIFIERS

### Medium and high power

Class-AB audio amplifiers offer excellent clarity and signal fidelity. Featuring pure analog, this signal quality is paid for with lower power efficiency relative to class D amplifiers. Nevertheless, these reliable components offer a warm, full-bodied tone that guarantees their place in the best audio systems available. The TDA729X family is recognized as a preferred solution for systems made with audiophiles in mind.

| Part number | Mono | Stereo | Output power per channel (W) (1) | Mute/Standby | Supply voltage min/max (V) | Packages |
|---|---|---|---|---|---|---|
| **TDA2009A** | | • | 10 | | 8/28 | Multiwatt 11 |
| **TDA7269A** | | • | 14 | • | ±5/±22 | Multiwatt 11 |
| **TDA7264** | | • | 25 | • | ±5/±25 | Multiwatt 8 |
| **TDA7265** | | • | 25 | • | ±5/±25 | Multiwatt 11 |
| **TDA7265A** | | • | 25 | • | 10/50 | Multiwatt 11 |
| **TDA7265B** | | • | 30 | • | ±8/±35 | Multiwatt 11 |
| **TDA7266M** | • | | 7 | • | 3/18 | Multiwatt 15 |
| **TDA7266** | | • | 7 | • | 3/18 | Multiwatt 15 |
| **TDA7292** | | • | 40 | • | ±8/±35 | Multiwatt 11 |
| **TDA7296** | | • | 60 | • | ±10/±40 | Multiwatt 15 |
| **TDA7295** | • | | 80 | • | ±10/±40 | Multiwatt 15 |
| **TDA7294V/HS** | • | | 10 | • | ±10/±40 | Multiwatt 15 |
| **TDA7293V/HS** | • | | 100 | • | ±12/±50 | Multiwatt 15 |
| **STA540** | | 2/3/4 ch | (2) | • | 8/22 | Multiwatt 15 |

Notes:
(1) Output power specified at THD = 10%
(2) Output power : 2 x 26 W; 2 x 12 W + 1 x 26 W; 4 x 12 W

### Class AB, low power

ST's low-power class-AB audio amplifiers offer quality and simplicity of use in applications such as small active speakers, radio and in all audio equipment requiring low power and high-quality audio.

| Part number | Mono | Stereo | Output power per channel (W) | Mute/standby | Supply voltage min/max (V) | Packages |
|---|---|---|---|---|---|---|
| **TDA2822D** | • | • | 1 x 1, 2 x 0.3 | | 1.8/15 | SO8 |
| **TDA7233D** | • | | 1 | | 1.8/15 | SO8 |
| **TDA7266P** | | • | 5 | • | 3.5/12 | PowerSO-20 |
| **TDA7266D** | | • | 3 | • | 3.5/12 | PowerSSO-24 |

## CLASS-D ANALOG AMPLIFIERS

ST's analog switch-mode class-D power amplifiers enable a higher efficiency, thus reducing the power dissipation and the need for larger heatsinks.
The class-D portfolio ranges from 3 W up to 2 x 160 W in mono and stereo configurations and offers:

- Filtered and filterless operation
- External synchronization
- Selectable gains
- Surface-mount PSO36 and PSSO36 slug-up and -down packages for optimized space

| Part number | Channels | Output power (W) | Selectable gain (dB) | Filterless | Differential inputs | Supply voltage min/max (V) | Packages |
|---|---|---|---|---|---|---|---|
| **TDA7493** | 1 | 2 x 3 | 20, 26, 30, 36 | • | • | 3 to 5.5 | HTSSOP24 |
| **TDA7491LP** | 2 | 2 x 5 | 20, 26, 30, 36 | • | • | 5 to 14 | PSSO36 slug-down |
| **TDA7491P** | 2 | 2 x 10 | 20, 26, 30, 36 | • | • | 5 to 18 | PSSO36 slug-down |
| **TDA7491HV** | 2 | 2 x 20 | 20, 26, 30, 36 | | • | 5 to 18 | PSSO36 slug-down |
| **TDA7491MV** | 1 | 1 x 25 | 20, 26, 30, 36 | | • | 5 to 18 | PSSO36 slug-down |
| **TDA7492** | 2 | 2 x 50 | 21.6, 27.6, 31.1, 33.6 | | • | 10 to 26 | PSSO36 slug-up |
| **TDA7492P** | 2 | 2 x 25 | 21.6, 27.6, 31.1, 33.6 | | • | 10 to 26 | PSSO36 slug-down |
| **TDA7492MV** | 1 | 1 x 50 | 21.6, 27.6, 31.1, 33.6 | | • | 10 to 26 | PSSO36 slug-down |
| **TDA7492PE** | 2 | 2 x 45 | 20.8, 26.8, 30, 32.8 | | • | 7 to 26 | PSSO36 slug-down |
| **TDA7492E*** | 2 | 2 x 60 | 20.8, 26.8, 30, 32.8 | | • | 7 to 26 | PSSO36 slug-up |
| **TDA7498L** | 2 | 2 x 80 | 25.6, 31.6, 35.1, 37.6 | | • | 10 to 36 | PSSO36 slug-up |
| **TDA7498** | 2 | 2 x 100 | 25.6, 31.6, 35.1, 37.6 | | • | 10 to 36 | PSSO36 slug-up |
| **TDA7498MV** | 1 | 1 x 100 | 25.6, 31.6, 35.1, 37.6 | | • | 10 to 36 | PSSO36 slug-up |
| **TDA7498E** | 2 | 2 x 160<br>1 x 220 | 23.8, 29.8, 33.3, 35.8 | | • | 14 TO 36 | PSSO36 slug-up |

• coming soon

## Headphone and low power for portables

ST's headphone and low-power amplifier portfolio offers the design and feature flexibility needed to fit your application perfectly:

- Class-AB, class-G and filterless class-D architectures for optimal audio performance and power efficiency
- Integrated features to reduce bill of materials, such as capless and filterless amplification
- Many packaging options, including ultra-tiny packages for applications where board space is at a premium

| Part number | Description | Channels | Output power (W) | Supply voltage min/ max (V) | Packages |
|---|---|---|---|---|---|
| **TDA2822D** | Dual low-voltage power amplifier | • | 1 x 1, 2 x 0.3 | 1.8/15 | SO8 |
| **TDA7233D** | 1W audio amplifier with mute | | 1 | 1.8/15 | SO8 |
| **TS2007** | 3 W filter free class D with fixed gain | 1 | 1 x 3 | 2/5.05 | UFQFPN8 |
| **TS2007FC** | 3 W filter free class D with 6-12 dB gain select | 1 | 1 x 3 | 2/5.05 | Flip-Chip 500u |
| **TS2012** | Filter free 2 x 2.8W class D | 2 | 2 x 2.8 | 2/5.05 | VFQFPN 20 |
| **TS2012FC** | Filter free 2 x 2.8W class D | 2 | 2 x 2.8 | 2/5.05 | |
| **TS419** | 360 mW class AB | 1 | 1x 0.36 | 2/5.05 | MSOP/TSSOP8 |
| **TS421** | 360 mW class AB | 1 | 1 x 0.36 | 2/5.05 | VDFPN 8 |
| **TS4601B** | High-performance headphone amplifier with capless output and I²C bus interface | 2 | 2 x 0.1 | 2/5.05 | Flip-Chip 500u |
| **TS4621B** | High-performance class-G headphone amplifier with I²C volume control | 2 | 2 x 0.25 | 2/4.08 | Flip-Chip 400u |
| **TS4621E** | High-performance class-G headphone amplifier with I²C volume control | 2 | 2 x 0.25 | 2/4.08 | Flip-chip 400u |
| **TS4621ML** | High-performance class G headphone amplifier with I²C volume control | 2 | 2 x 0.25 | 2/4.08 | Flip-chip 400u |
| **TS4657** | Digital audio line driver with 2.2 Vrms capless outputs | | | 3/5.05 | VFQFPN 20 |
| **TS472** | Very-low-noise microphone preamplifier | 1 | | 2/5.05 | Flip-chip 500u,VFQFPN24 |
| **TS482** | 100 mW stereo headphone amplifier | 2 | 2 x 0.1 | 2/5.05 | MSOP/TSSOP8/SO8 |
| **TS4871** | 1 W audio amplifier with standby | 1 | 1 x 1 | 2/5.05 | MSOP/TSSOP8,SO8,VDFPN8 |
| **TS488** | 120 mW stereo headphone amplifier | 1 | 2 x 0.12 | 2/5.05 | UFSON8 |
| **TS4890** | 1 W audio amplifier with standby | 1 | 1 x 1 | 2/5.05 | MSOP/TSSOP8,SO8 |
| **TS4909** | Ultra-low-power headphone amplifier with capless output | 1 | 1 x 0.88 | 2/5.05 | VDFPN10 |
| **TS4962** | 3 W filter free class D with standby | 1 | 1 x 3 | 2/6 | UFQFPN8 |
| **TS4962M** | 3 W filter free | 1 | 1 x 3 | 2/5.05 | Flip-chip 500u |
| **TS4984** | 2 x 1 W audio amplifier with standby | 2 | 2 x 1 | 2/5.05 | VFQFPN16 |
| **TS4990** | 1.2 W audio amplifier with standby | 1 | 1 x 1.2 | 2/5.05 | Flip-chip 500u, MSOP/TSSOP8, SO8,VDFPN8 |
| **TS4994** | 1 W differential input/output audio amplifier with selectable standby | 1 | 1 x 1 | 2/5.05 | MSOP/TSSOP8, VDFPN10 |
| **TS4994FC** | 1 W differential input/output audio amplifier with selectable standby | 1 | 1 x 1 | 2/5.05 | Flip-chip 500u |
| **TS4995** | 1.2 W fully differential amplifier with selectable standby and 6 dB fixed gain | 1 | 1 x 1.2 | 2/5.05 | Flip-chip 500u |
| **TS4999** | 2 x 2.8 W class-D audio amplifier with selectable 3D effects | 2 | 2 x 2 | 2/5.05 | Flip-chip 500u |

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