

PORTABLE CONSUMER CODEC DESCRIPTION

The TSCS25XX is a low-power, high-fidelity integrated CODEC with 32 bit stereo playback stereo record functionality. In addition to a high-fidelity low-power CODEC, the device integrates the a true cap-less headphone amplifier.

The digital audio data format (I2S) works in master or slave mode and supports left/right justified, DSP and TDM modes.

Beyond high-fidelity for portable systems, the device offers an enriched “audio presence” through built-in audio output processing DSP engine (AOP). The AOP supports 12 Bands of EQ, Psychoacoustic Bass and Treble enhancement, 3D stereo enhancement and Dynamic Range controller to support Multi-band Compressor/Limiter capability.

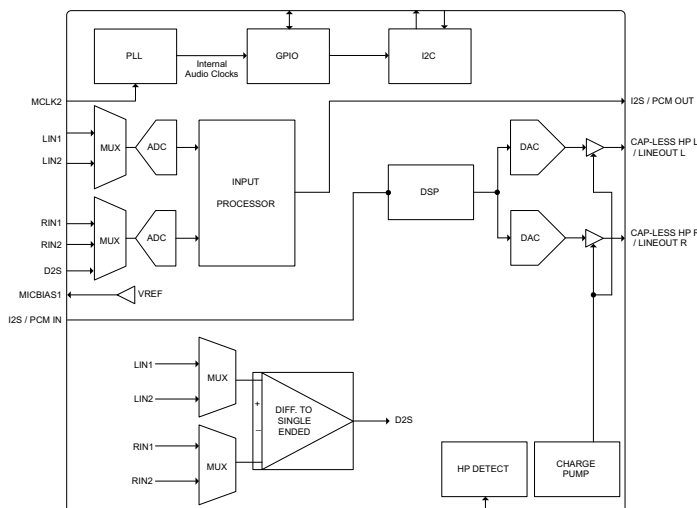
APPLICATIONS

- Multimedia handsets

PART NUMBERS

TSCS25A3X1NDGXyyX	Analog Microphone
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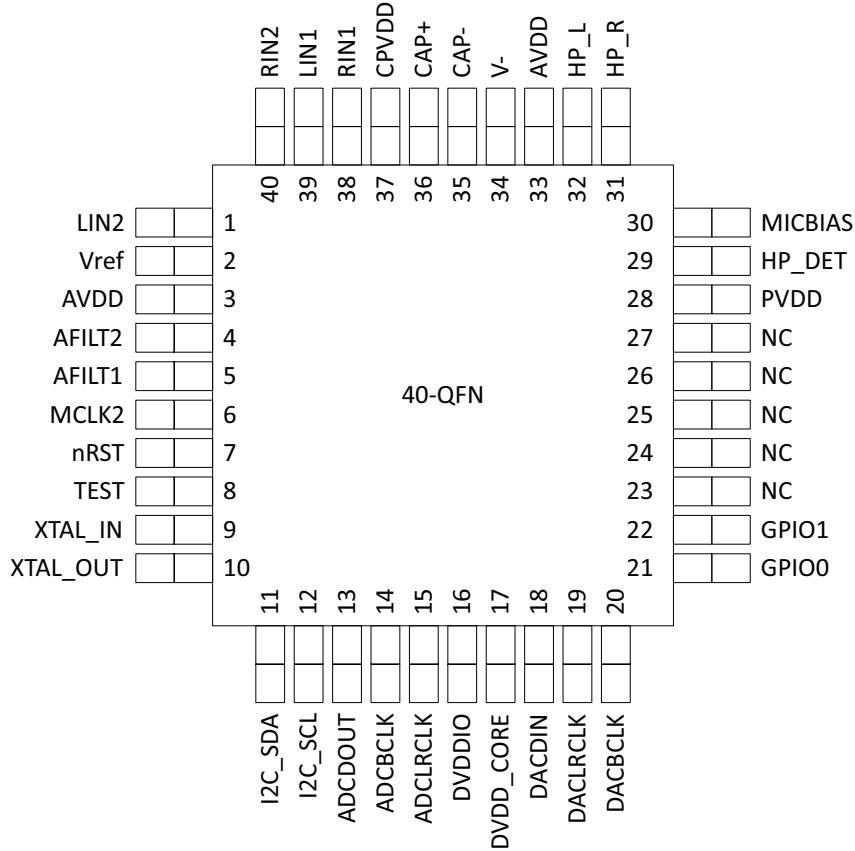
yy = silicon revision, contact TSI for current part number.



FEATURES

- **On-chip true cap-less headphone driver**
 - ◆ 40 mW output power (16Ω)
 - ◆ Charge-pump allows true ground centered outputs
 - ◆ SNR (A-Weighted, no active signal) -122dB
 - ◆ SNR (A-Weighted, -60db active signal) -102dB
 - ◆ Headphone detection logic
- **High fidelity CODEC**
 - ◆ 2 DAC 102dB SNR
 - ◆ 2 ADC 90dB SNR
 - ◆ 32 bit stereo DAC and 32-bit stereo ADC
 - ◆ Sample rates of 8k to 96 kHz
- **Audio Output Processing DSP Engine**
 - ◆ 3D stereo enhancement
 - ◆ 12 band parametric equalizers
 - ◆ Dynamic Range controller
 - Multi-band compressor
 - Limiter
 - Expander
 - ◆ Psychoacoustic Bass and Treble enhancement processing
- **Microphone/line-in interface**
 - ◆ Analog microphone and line-in inputs
 - ◆ Automatic level control
- **Low power with built in power management**
 - ◆ 1.7 V CODEC supports 1Vrms
 - ◆ Very low standby and no-signal power consumption
 - ◆ 1.8V digital / 1.7V analog supply for low power
- **2-wire (I²C compatible) control interface**
- **I²S data interface**
 - ◆ Supports Bluetooth TDM mode
 - ◆ Left-Justified, Right-Justified, DSP, and TDM Audio Interfaces
- **Package option**
 - ◆ 5x5 QFN

BLOCK DIAGRAM



AUDIO INPUTS

The TSCS25XX provides multiple digital and analog audio inputs. Audio inputs include

- ◆ One digital audio input
 - Supports all I2S formats as well as direct Bluetooth PCM mode
- ◆ Two mux selectable stereo microphone/line-in inputs with selectable differential input option

The device provides input gain control, separate volume controls, automatic leveling capability, and programmable microphone boost to smooth input recording. A programmable silence “floor” or “threshold” can be set to minimize background noise.

TSCS25XX

Portable Consumer CODEC

AUDIO OUTPUTS

The TSCS25XX provides a Capless stereo headphone/Line-out port with ground referenced outputs, capable of driving headphones without requiring an external DC blocking capacitor.

Each endpoint features independent volume controls, including a soft-mute capability which can slowly ramp up or down the volume changes to avoid unwanted audio artifacts.

The TSCS25XX output signal paths consist of digital filters, DACs and output drivers. The digital filters and DACs are enabled when the TSCS25XX is in 'playback only' or 'record and playback' mode. The output drivers can be separately enabled by individual control bits.

The digital filter and audio processing block processes the data to provide volume control and numerous sound enhancement algorithms. Two high performance sigma-delta audio DACs convert the digital data into analog. The digital audio data is converted to oversampled bit streams using 24-bit digital interpolation filters, which then enters sigma-delta DACs, and become converted to high quality analog audio signals.

To enhance the sound available from the small, low-power speakers typically found in a portable device, the TSCS25XX provides numerous audio enhancement capabilities. The TSCS25XX features 12 independent, programmable left/right equalization, allowing the system designer to provide an advanced system equalizer to accommodate the specific speakers and enclosure design. A multiband compressor/limiter features programmable attack and release thresholds, enabling the system designer to attenuate loud noise excursions to avoid speaker artifacts, thus allowing the underlying content to be played at a louder volume without distortion. For compressed audio, a programmable expander is available to help restore the dynamic range of the original content. A stereo depth enhancement algorithm allows common left/right content (e.g. dialog) to be attenuated separately from other content, providing a perceived depth separation between background and foreground audio. Psychoacoustic bass and treble enhancement algorithms 3D sound achieve a rich, full tone even from originally compressed content, and even with speakers generally unable to play low-frequency sounds.



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