Integrated ARM® Cortex® M0+ MCU and Class-H Headphone Amplifier

Product Overview

The Conexant® AudioSmart™ CX20889 is a single-chip solution for applications such as wired or wireless headsets, docking stations and voice command products. The CX20889 combines the benefits of a USB-C codec with the power of DSP. With an onboard 24-bit/96 kHz digital and analog I/O, microphone preamplifiers and a capless headphone amplifier, the CX20889 is a true single-chip solution for applications that demand high audio quality and lower power consumption.

Peripheral components expand the CX20889’s utility, including:
- One I²C-bus master and one slave interface (or two I²C masters).
- Two I²S interfaces
- One Serial Peripheral Interface (SPI)
- Two multi-rate timers
- A self wake-up timer
- Four monitor ADCs
- Two PDM digital microphone interfaces
- S/PDIF input and output
- Up to 28 General Purpose Input/Output (GPIO) pins.

The CX20889 integrates a high-performance stereo ADC (98 dB dynamic range) and DAC (105 dB dynamic range).

Microphone performance is enhanced through programmable preamps paired with a dedicated bias supply to eliminate crosstalk. A ground-referenced output removes the need for capacitors on the headphone output, ensuring consistent performance with a wide variety of transducers. An integrated DC-DC converter supports internal power switches, dynamic voltage scaling, and frequency scaling mechanisms to reduce power consumption. It can also provide power for all peripheral devices connected to the board.

Key Features

- ARM Cortex-M0+ controller, up to 50 MHz operation
- Conexant’s dual-core, 32-bit hardware fixed point DSP, up to 100 MHz operation
- Floating point assist
- Up to 504 KB in SRAM
- Wake on Voice (WoV)
- Skype and USB 2.0 compliant full-speed device
- Ambient noise cancellation up to 30dB (depending on the headset design)
- Up to 3.5 kHz frequency band noise attenuation (depending on the headset design) with ANC
- Support of feed forward, hybrid ANC
- Adaptive ANC
- Two six-wire I²S/Pulse Code Modulation (PCM) devices
- S/PDIF input and output
- Two stereo PDM Digital Microphone Interfaces (DMICs)
- Two I²C masters, or one I²C master and one I²C slave One SPI connected to an external SPI flash memory with two Chip Selects (CSs).
- One UART supporting up to 3.125 Mbps data rate
- One watchdog timer
- Two tri-color, RGB (PWM) LED drivers
- One stereo ADC (98 dB dynamic range, A-weighted) and one stereo DAC (105 dB dynamic range, A-weighted)
- Standard sampling rates support 8 kHz to 96 kHz
- Built-in, four-conductor headset jack supports headphone/headset auto-detection, as well as auto switching between Apple-style and Nokia-style headsets.
- Four monitor 10-bit ADCs that support volume control, temperature sensor, and battery monitor.
- Up to 28 GPIOs
- Single wide range input power supply (2.70V–5.25V)
- Temperature range of –40°C to 85°C
## Electrical Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DAC Output Path (Lineout_L, Lineout_R) Line-Out Load R_L=10kΩ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Range</td>
<td>-</td>
<td>-</td>
<td>105</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>THD+N</td>
<td>-3 dBFS (0.707V_rms)</td>
<td>-</td>
<td>-79</td>
<td>-</td>
<td>dB</td>
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<tr>
<td>Crosstalk</td>
<td>10 kHz @ –20 dBFS</td>
<td>-</td>
<td>-92</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>PSRR</td>
<td>100 mV_p-p, 1 kHz, Any Supply</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td><strong>DAC Output Path (HP_L, HP_R) Headphone Load R_L=32 Ω</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Dynamic Range</td>
<td>-</td>
<td>-</td>
<td>104</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>THD+N</td>
<td>–3 dBFS (0.707V_rms) Pout = 15.6 mW</td>
<td>-</td>
<td>-77</td>
<td>-</td>
<td>dB</td>
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<tr>
<td>Crosstalk</td>
<td>10 kHz @ –20 dBFS</td>
<td>-</td>
<td>-83</td>
<td>-</td>
<td>dB</td>
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<tr>
<td>PSRR</td>
<td>100 mV_p-p, 1 kHz, Any Supply</td>
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<td>-</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td><strong>Headphone Output Driver (HP_L, HP_R)</strong></td>
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<tr>
<td>Minimum Output Load Resistance</td>
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<td>TBD</td>
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<td>-</td>
<td>Ω</td>
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<tr>
<td>Maximum Output Load Capacitance</td>
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<td>400</td>
<td>pF</td>
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</table>
Benefits

- Brings USB-C technology to mobile/portable devices that require low power consumption.
- Adds extensive DSP capabilities for easy and powerful tuning of audio products.
- Ideal for wired or wireless headsets, docking stations, voice recognition, and many other applications.

Test Conditions

- $V_{5V\_DIG} = V_{5V\_ANA} = 5V$
- $DVDD12 = 1.2V$
- $AVDD18 = DVDD18 = PVDD = 1.8V$
- $MVDD=-1.7V$, $AGND=DGND=0V$
- $T_A = 25°C$
- $fin = 997\ Hz$
- $fs = 48\ kHz$
- Gain setting = 0 dB
- 24-bit audio data
Package Drawing

Ordering Information

<table>
<thead>
<tr>
<th>Ordering Part Number</th>
<th>Part Number</th>
<th>Description</th>
<th>Package</th>
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<tbody>
<tr>
<td>DSAC-L889-10CH</td>
<td>CX20889-10Z</td>
<td>Low-Power USB Type C DSP CODEC.</td>
<td>7 x 7 mm 88-pin VLGA</td>
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