CX20888 Low-Power USB Type-C DSP CODEC with Active Noise Cancellation

AudioSmart™ Product Brief

CONEXANT®
EXPERIENCE SMART™

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

Product Overview

The Conexant® AudioSmart™ CX20888 is a single-chip solution for headset applications. Its Active Noise Cancellation (ANC) eliminates up to 30 dB of external sound, for a clearer, more enjoyable listening experience.

The CX20888 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 CX20888 is a true single-chip solution for applications that demand high audio quality and lower power consumption. Peripheral components expand the CX20888's utility, including:

- One I^2C-bus master and one slave interface (or two I^2C masters).
- One I^2S interface
- One Serial Peripheral Interface (SPI)
- Two multi-rate timers
- A self wake-up timer
- Four monitor ADCs that support volume control, temperature sensor, and battery monitor
- Two PDM digital microphone interfaces
- S/PDIF input
- Up to 20 General Purpose Input/Output (GPIO) pins.

The CX20888 integrates a high-performance stereo ADC (98 dBA dynamic range) and DAC (105 dBA dynamic range). Microphone performance is enhanced through programmable preamplifiers 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.

The device has the configuration capability to switch between ANC ON and OFF mode and Ambient Inclusion ON and OFF mode.

Key Features

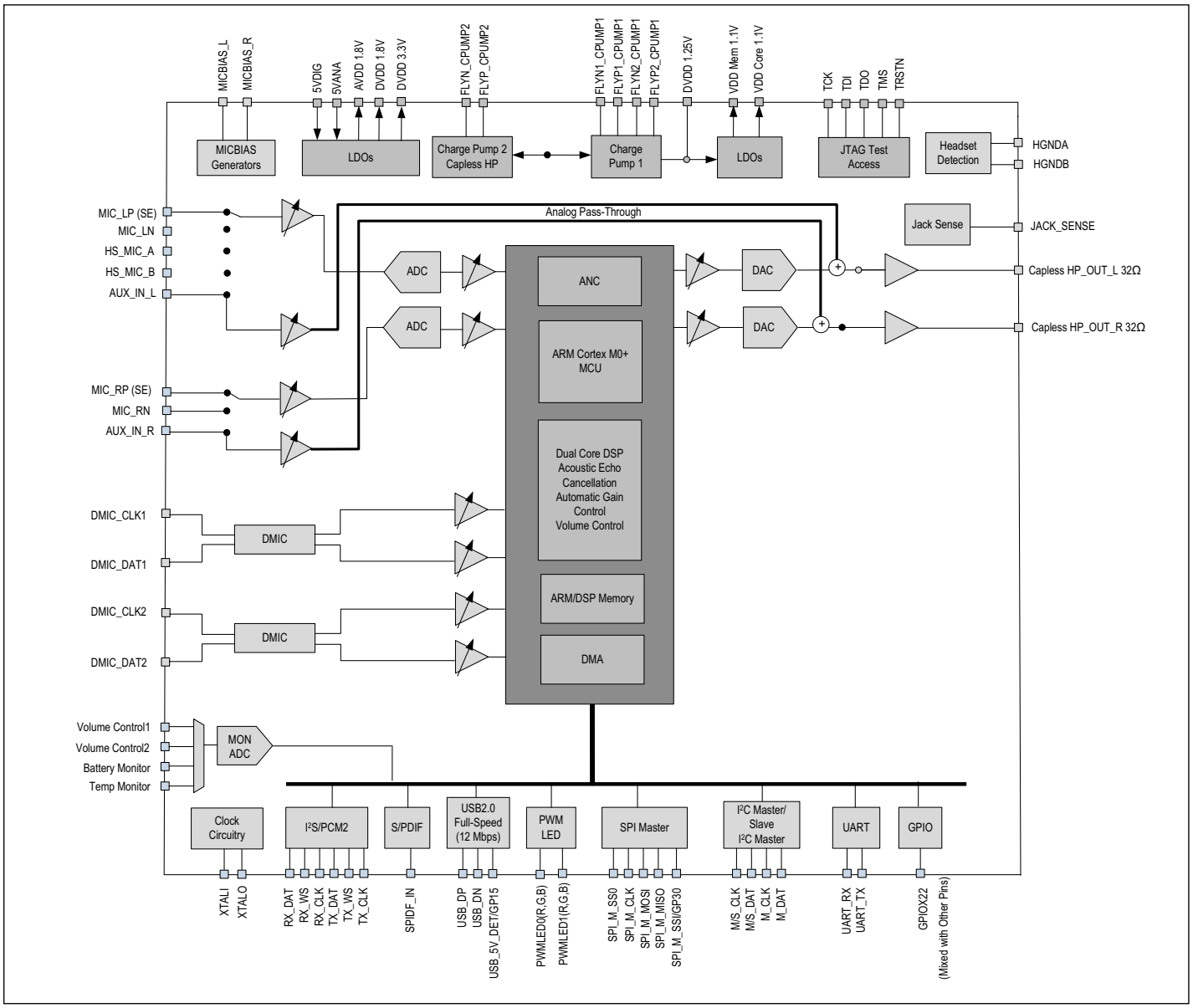
- ARM Cortex-M0+ controller, up to 50 MHz operation
- Conexant's dual-core, 32-bit hardware fixed point DSP, up to 100 MHz operation
- Floating point assist
- Up to 504 KB in SRAM
- Wake on Voice (WoV)
- Skype and USB 2.0 compliant full-speed device
- One six-wire I^2S/Pulse Code Modulation (PCM) device
- S/PDIF input
- Two stereo PDM Digital Microphone Interfaces (DMICs)
- Two I^2C masters, or one I^2C master and one I^2C slave One SPI connected to an external SPI flash memory with two Chip Selects (CSs).
- One UART
- One watchdog timer
- One 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.
- Three monitor 10-bit ADCs that support volume control, temperature sensor, and battery monitor.
- Low-latency ANC
- ANC up to 30 dB noise cancellation
- ANC effective at frequencies of up to 3.8 kHz
- Single wide range input power supply (2.70V–5.25V)
- Temperature range of -40°C to 85°C

Electrical Characteristics

Parameter	Test Conditions	Minimum	Typical	Maximum	Unit
DAC Output Path (Lineout_L, Lineout_R) Line-Out Load R_L=10kΩ					
Dynamic Range	-	-	105	-	dB
THD+N	–3 dBFS (0.707V_{rms})	-	–79	-	dB
Crosstalk	10 kHz @ –20 dBFS	-	–92	-	dB
PSRR	100 mV_{p-p}, 1 kHz, Any Supply 100 mV_{p-p}, 10 kHz, Any Supply	-	-	-	dB
DAC Output Path (HP_L, HP_R) Headphone Load R_L=32 Ω					
Dynamic Range	-	-	104	-	dB
THD+N	–3 dBFS (0.707V_{rms}) Pout = 15.6 mW	-	–77	-	dB
Crosstalk	10 kHz @ –20 dBFS	-	–83	-	dB
PSRR	100 mV_{p-p}, 1 kHz, Any Supply 100 mV_{p-p}, 10 kHz, Any Supply	-	-	-	dB
Headphone Output Driver (HP_L, HP_R)					
Minimum Output Load Resistance	-	TBD	-	-	Ω
Maximum Output Load Capacitance	-	-	-	400	pF

Parameter	Test Condition	Minimum	Typical	Maximum	Units
Maximum Full Scale Input	Single-ended Input	-	-	0.5 –6	Vrms dBv
	Differential Input	-	-	1 0	Vrms dBv
Input Resistance	Line-In (Single-ended) –6 dB Line-In (Single-ended) 0 dB Mic-In (Single-ended) Mic-In (Differential)	-	8K 16K 500K 500K	-	Ω
Programmable Gain	Line-In (Single-ended) Line-In Gain Step Mic-In (Single-ended and Differential) Mic-In Gain Steps	–6 - 6 -	- 6 - 1	0 - 30 -	dB
Dynamic Range	Differential Mic-In (6 dB PGA Gain)	-	98	-	dB
THD+N	Differential Mic-In (6 dB PGA Gain) -3 dBFS	-	–86	-	dB
Channel Separation	Differential Mic-In	-	–87	-	dB
Common Mode Rejection	–20 dBV Input of 217 Hz PGA in Differential Mode; 6 dB Gain	-	–85	-	dB

System Block Diagram



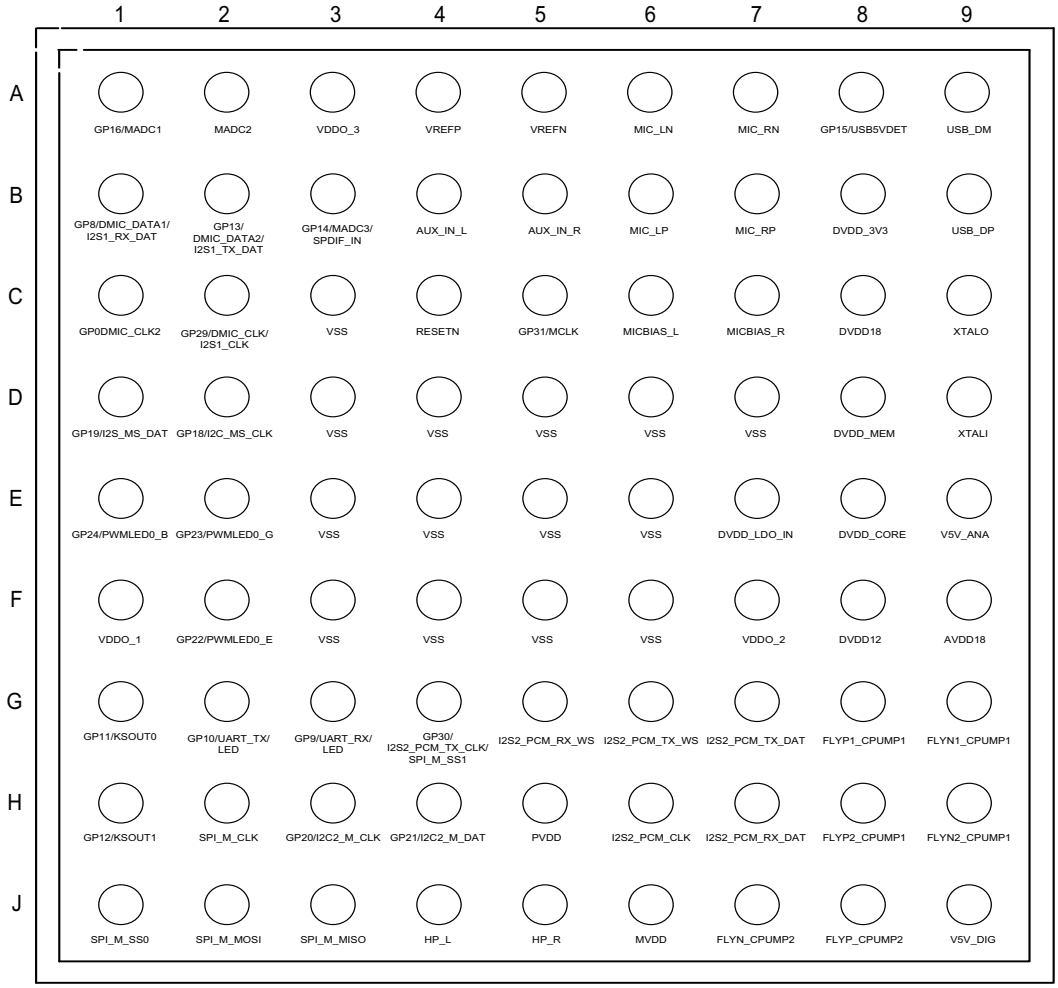
Benefits

- 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.
- Improves sound quality by reducing background ambient noise.

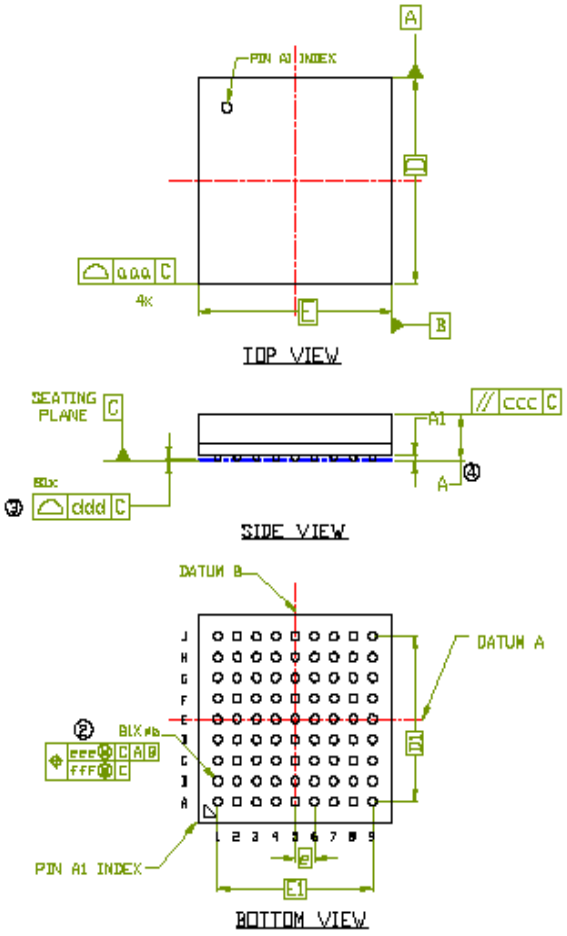
Test Conditions

- V5V_DIG = V5V_ANA = 5V
- DVDD12 = 1.2V
- AVDD18 = DVDD18 = PVDD = 1.8V
- MVDD=-1.7V, AGND=DGND=0V
- T_A = 25°C
- fin = 997Hz
- fs = 48kHz
- Gain setting = 0dB
- 24-bit audio data

Pinout



Package Drawing



DIMENSIONAL REFERENCES (mm)

REF.	Min.	Nom.	Max.
A	1.23	1.31	1.39
A1	0.19	0.24	0.29
b	0.26	0.31	0.36
D	5.00 BSC		
E	5.00 BSC		
D1	4.00 BSC		
E1	4.00 BSC		
e	0.50 BSC		

DIMENSIONAL REFERENCES (mm)

REF.	TOLERANCE OF FORM AND POSITION
aaa	0.10
ccc	0.20
ddd	0.08
eee	0.15
fff	0.05

Notes:

1. 'e' REPRESENTS THE BASIC SOLDER BALL GRID PITCH.
2. DIMENSION 'b' IS MEASURABLE AT THE MAXIMUM BALL DIAMETER AFTER REFLOW, PARALLEL TO PRIMARY DATUM C. PRE-REFLOW DIAMETER IS 0.30mm.
3. PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE CONTACT BALLS.
4. DIMENSION 'A' INCLUDES STANDOFF HEIGHT 'A1', PACKAGE BODY THICKNESS AND LID HEIGHT (IF APPLICABLE), BUT DOES NOT INCLUDE ATTACH FEATURES.
5. PACKAGE DIMENSIONS TAKE REFERENCE TO JEDEC MO-275 REV.A Violation : D.E..

Ordering Information

Ordering Part Number	Part Number	Description	Package
DSAC-L888-10CH	CX20888-10Z	Low-Power USB Type-C DSP CODEC with Active Noise Cancellation	5 x 5 mm 81-pin BGA

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