

# 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 I<sup>2</sup>C-bus master and one slave interface (or two I<sup>2</sup>C masters).
- Two I<sup>2</sup>S 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 dBA dynamic range) and DAC (105 dBA 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.

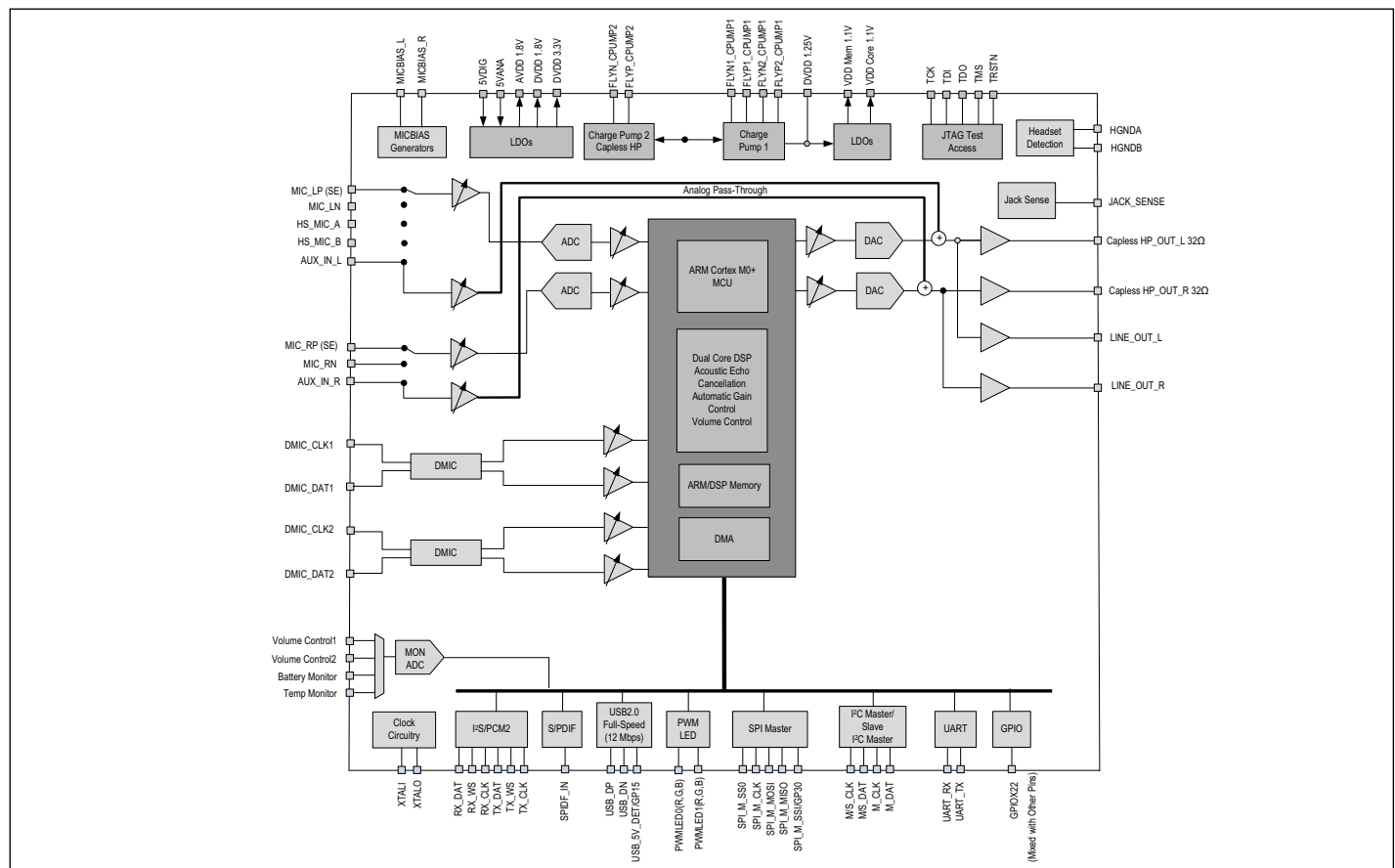
## Key Features

- 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 I<sup>2</sup>S/Pulse Code Modulation (PCM) devices
- S/PDIF input and output
- Two stereo PDM Digital Microphone Interfaces (DMICs)
- Two I<sup>2</sup>C masters, or one I<sup>2</sup>C master and one I<sup>2</sup>C 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

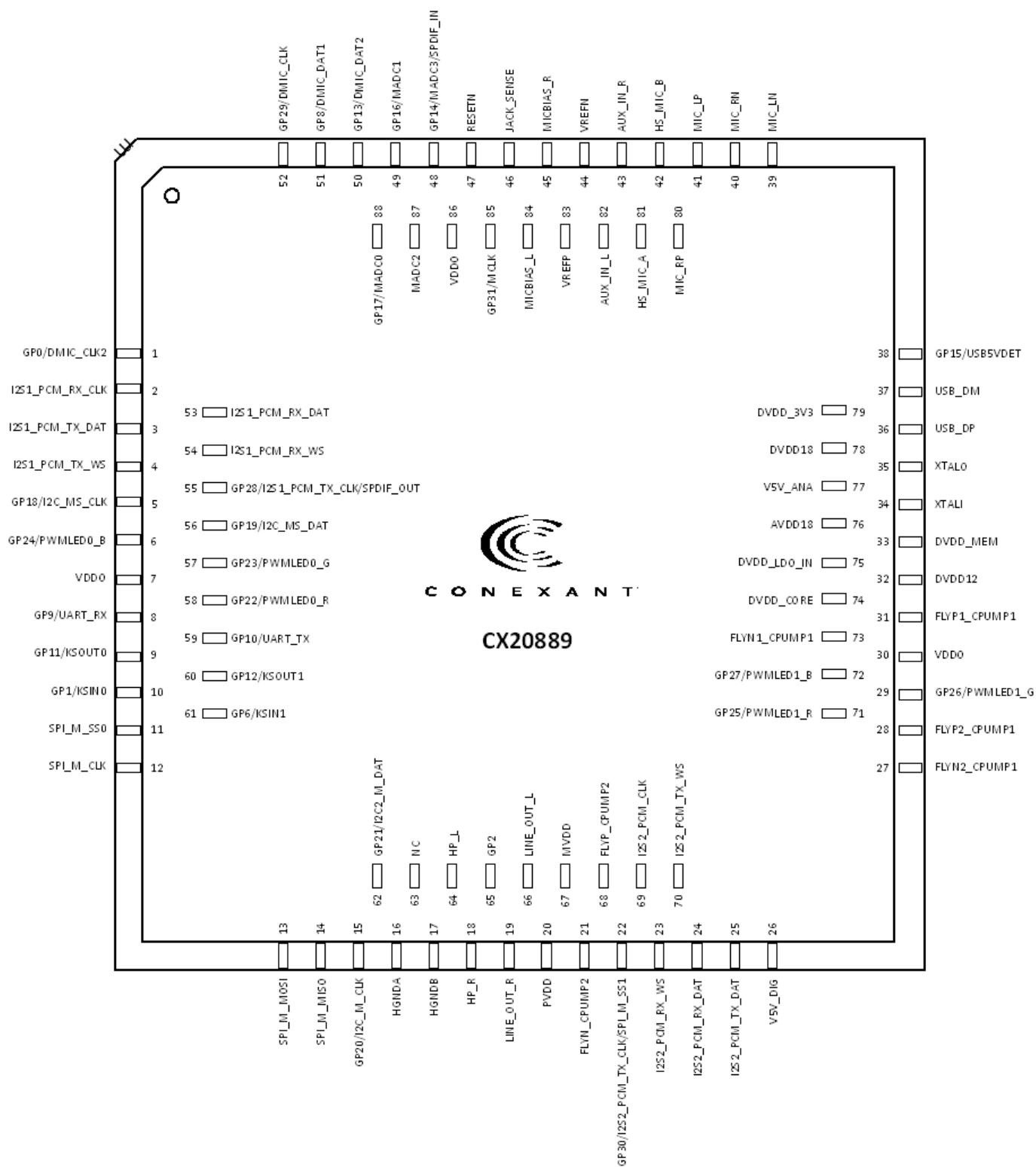
## Electrical Characteristics

Parameter	Test Conditions	Minimum	Typical	Maximum	Unit
DAC Output Path (Lineout_L, Lineout_R) Line-Out Load $R_L=10k\Omega$					
Dynamic Range	-	-	105	-	dB
THD+N	-3 dBFS (0.707V <sub>rms</sub> )	-	-79	-	dB
Crosstalk	10 kHz @ -20 dBFS	-	-92	-	dB
PSRR	100 mV <sub>p-p</sub> , 1 kHz, Any Supply	-	-	-	dB
	100 mV <sub>p-p</sub> , 10 kHz, Any Supply				
DAC Output Path (HP_L, HP_R) Headphone Load $R_L=32\ \Omega$					
Dynamic Range	-	-	104	-	dB
THD+N	-3 dBFS (0.707V <sub>rms</sub> ) Pout = 15.6 mW	-	-77	-	dB
Crosstalk	10 kHz @ -20 dBFS	-	-83	-	dB
PSRR	100 mV <sub>p-p</sub> , 1 kHz, Any Supply	-	-	-	dB
	100 mV <sub>p-p</sub> , 10 kHz, Any Supply				
Headphone Output Driver (HP_L, HP_R)					
Minimum Output Load Resistance	-	TBD	-	-	$\Omega$
Maximum Output Load Capacitance	-	-	-	400	pF

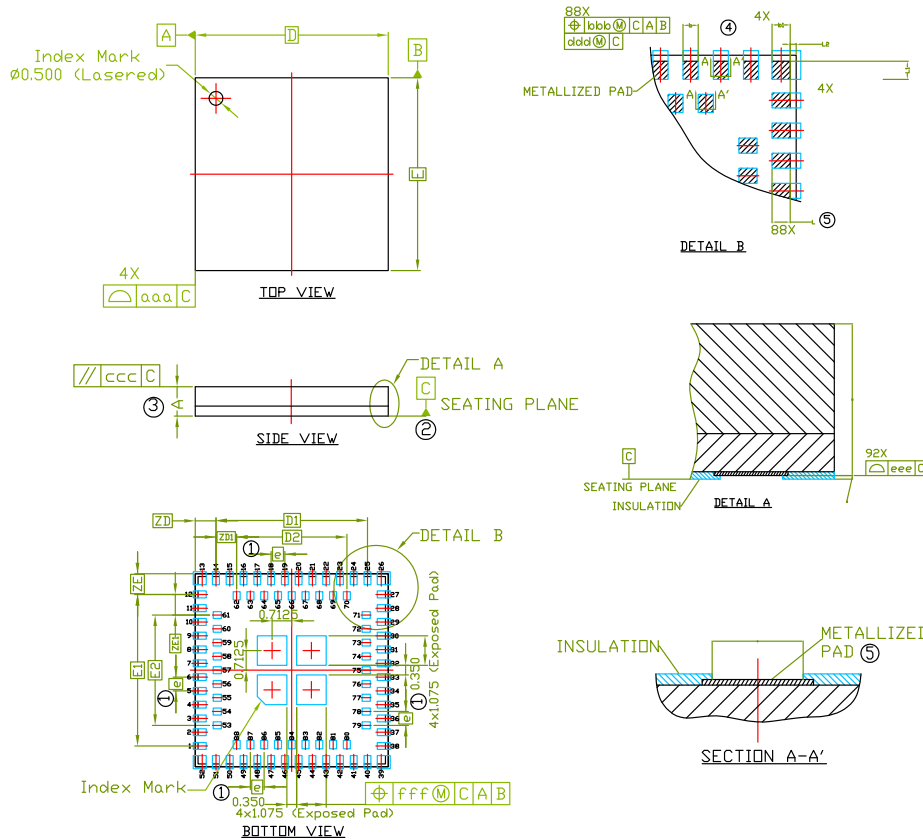
Parameter	Test Condition	Minimum	Typical	Maximum	Units
Maximum Full Scale Input	Single-ended Input	-	-	0.5	Vrms
				-6	dBv
	Differential Input	-	-	1	Vrms
Input Resistance				0	dBv
	Line-In (Single-ended) -6dB		8K		$\Omega$
	Line-In (Single-ended) 0dB	-	16K	-	
	Mic-In (Single-ended)		500K		
	Mic-In (Differential)		500K		
Programmable Gain	Line-In (Single-ended)	-6	-	0	dB
	Line-In Gain Step	-	6	-	
	Mic-In (Single-ended and Differential)	6	-	30	
	Mic-In Gain Steps	-	1	-	
Dynamic Range	Differential Mic-In (6dB PGA Gain)	-	98.1	-	dB
THD+N	Differential Mic-In (6dB 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



## Pinout



## Package Drawing



### DIMENSIONAL REFERENCES

Symbol	Min	Nom	Max
A	0.83	0.9	0.97
A1	—	—	0.05
A2	—	—	0.02
D	7.00	BSC	
E	7.00	BSC	
D1	5.50	BSC	
E1	5.50	BSC	
D2	4.00	BSC	
E2	4.00	BSC	
e	0.50	BSC	
b	0.20	0.25	0.30
L	0.25	0.30	0.35
b1	0.25	0.30	0.35
L1	0.25	0.30	0.35
L2	0.10	BSC	

### DIMENSIONAL REFERENCES

Symbol	Min	Nom	Max
ZD	0.75	BSC	
ZE	0.75	BSC	
ZD1	0.75	BSC	
ZE1	0.75	BSC	

### DIMENSIONAL REFERENCES

Ref	TOLERANCE OF FROM AND POSITION
aaa	0.10
bbb	0.10
ccc	0.20
ddd	0.08
eee	0.08
fff	0.10

Note:  
 ① 'e' REPRESENTS THE BASIC TERMINAL PITCH.  
 ② SPECIFIES THE TRUE GEOMETRIC POSITION OF THE TERMINAL AXIS.  
 DATUM 'C' IS THE MOUNTING SURFACE, WITH WHICH THE PACKAGE IS IN CONTACT.  
 ③ DIMENSION 'A' INCLUDES PACKAGE WARPAGE.  
 ④ DIMENSION 'b' APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.00mm AND 0.25mm FROM TERMINAL TIP.  
 ⑤ METALLIZED PADS ARE Cu PAD WITH IT'S EXPOSED SURFACE PLATED WITH Ni & Au.  
 ⑥ PACKAGE DIMENSIONS TAKE REFERENCE FROM JEDEC MO-208 REV.C.

## Ordering Information

Ordering Part Number	Part Number	Description	Package
DSAC-L889-10CH	CX20889-10Z	Low-Power USB Type C DSP CODEC.	7 x 7 mm 88-pin VLGA

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