

### FEATURES

- 1.8 V analog supply operation**
- 1.8 V to 3.3 V output supply**
- SNR = 59 dBFS up to 170 MHz input**
- SFDR = 75 dBc up to 70 MHz input**
- Low ADC core power:**
  - 28 mW/ch @ 20MSPS**
  - 65 mW/ch @ 80MSPS**
- Differential input with 650 MHz bandwidth**
- On-chip voltage reference and sample-and-hold amplifier**
- DNL =  $\pm 0.5$  LSB**
- Flexible analog input: 1 V p-p or 2 V p-p differential**
- Offset binary, Gray Code, or Twos Complement data format**
- Clock duty cycle stabilizer**
- Programmable Clock Divider**
- Data output clock**
- Serial port control**
  - Built-in selectable digital test pattern generation**
  - Programmable clock and data alignment**

### APPLICATIONS

- Ultrasound equipment**
- IF sampling in communications receivers**
- Direct conversion sampling**
- Battery-powered instruments**
- Hand-held scope meters**

### GENERAL DESCRIPTION

The AD9204 is a monolithic, dual channel 1.8 V supply, 10-bit, 20/40/65/80 MSPS analog-to-digital converter (ADC), featuring a high performance sample-and-hold circuit and on-chip voltage reference. The product uses a multi-stage differential pipeline architecture with output error correction logic to provide 10-bit accuracy at 80 MSPS data rates and guarantees no missing codes over the full operating temperature range.

The ADC contains several features designed to maximize flexibility and minimize system cost, such as programmable clock and data alignment and programmable digital test pattern generation. The available digital test patterns include built-in deterministic and pseudorandom patterns, along with custom user-defined test patterns entered via the serial port interface (SPI).

A differential clock input controls all internal conversion cycles. A duty cycle stabilizer (DCS) compensates for wide variations in the clock duty cycle while maintaining excellent overall ADC performance.

#### Rev. PrC

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### FUNCTIONAL BLOCK DIAGRAM

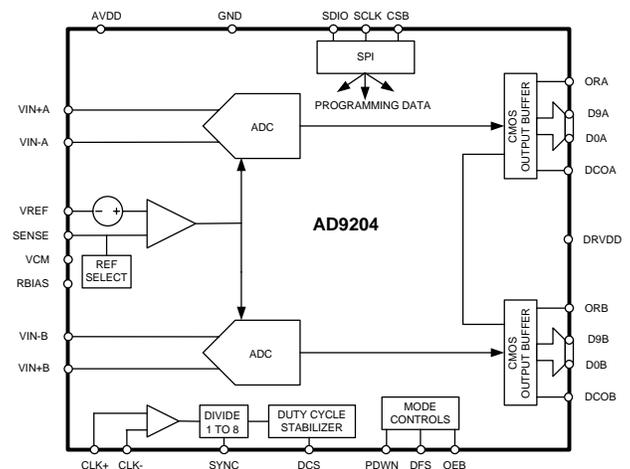


Figure 1.

The digital output data is available in Offset Binary, Gray Code, or Twos Complement formats. A data output clock (DCO) is provided for each ADC channel to ensure proper latch timing with receiving logic. Available in a 64-lead Pb-free LFCSP, the AD9204 is specified over the industrial temperature range ( $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ).

### PRODUCT HIGHLIGHTS

1. The AD9204 operates from a single 1.8 V power supply and features a separate digital output driver supply to accommodate 1.8 V to 3.3 V logic families.
2. The patented sample and hold circuit maintains excellent performance for input frequencies up to 200 MHz and is designed for low cost, low power and ease of use.
3. A standard serial port interface (SPI) supports various product features and functions, such as data formatting (offset binary, twos complement, or Gray coding), enabling the clock DCS, power-down, and voltage reference mode.
4. The AD9204 is pin compatible with the 12bit AD9231 and 14bit AD9251, allowing for a simple migration between 10 bits and 14 bits.

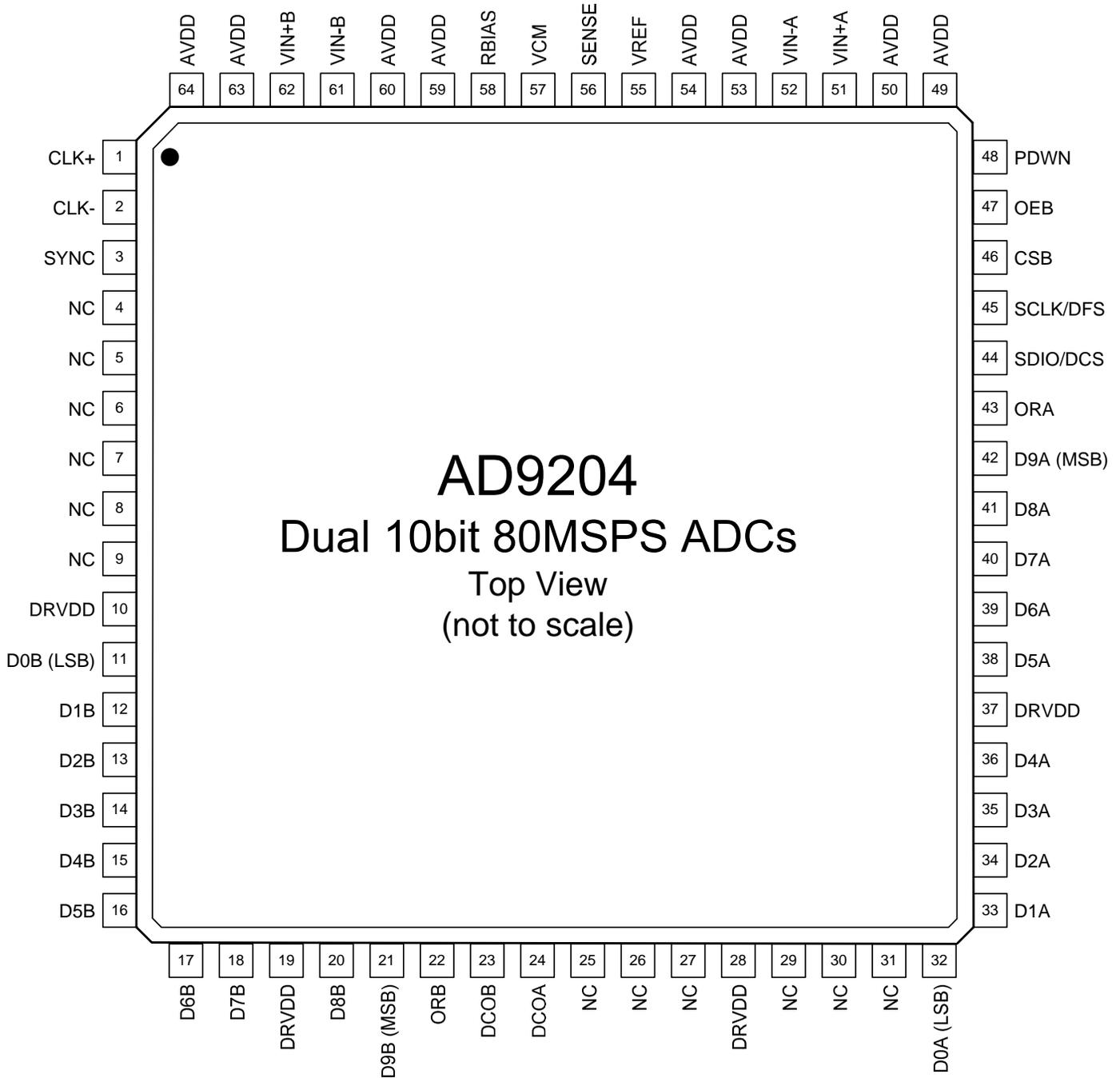
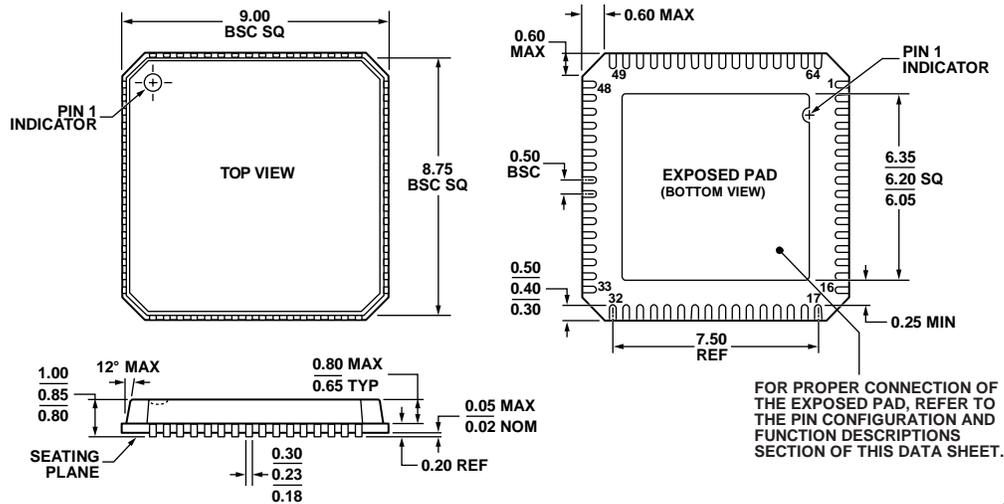


Figure 2. Device Pin Map

Pin #	Name	Description
0	GND	Exposed paddle is the only ground connection for the chip. Must be connected to PCB AGND.
49, 50, 53, 54, 59, 60, 63, 64	AVDD	1.8V Analog supply pins.
10, 19, 28, 37	DRVDD	Digital Output Driver Supply (1.8V to 3.3V)
51, 52	AINA+/-	Channel "A" analog inputs.
62, 61	AINB+/-	Channel "B" analog inputs.
1, 2	CLK+, CLK-	Differential encode clock; PECL, LVDS or 1.8V CMOS inputs.
58	RBIAS	Sets analog current bias. Connect to 10kohm (1% tolerance) resistor to ground.
57	VCM	Analog output voltage at mid supply to set common mode of the analog inputs.
56	SENSE	Reference Mode Selection
55	VREF	Voltage Reference Input/Output
46	CSB	SPI chip select; active low enable. 50Kohm internal pullup.
45	SCLK/DFS	SPI clock. Static control of data output format, DFS, if not in SPI mode. If "high": twos complement. If "low": offset binary. 50Kohm internal pulldown.
44	SDIO/DCS	SPI data in/out. Static enable for Duty Cycle Stabilizer if not in SPI mode. 50Kohm internal pulldown in SPI mode. 50Kohm internal pullup in non-SPI mode.
3	SYNC	Digital input. SYNC input to clock divider. 50Kohm internal pulldown.
47	OEB	Digital input. Enable channel "A" & "B" digital outputs if "low"; tri-state outputs if "high". 50Kohm internal pulldown.
48	PDWN	Digital input. Powerdown chip if "high". 50Kohm internal pulldown.
11-18, 20, 21	D0B-D9B	Channel B digital outputs. D9B = MSB
32-36, 38-42	D0A-D9A	Channel A digital outputs. D9A = MSB
22	ORB	Channel B Out-of-Range digital output.
43	ORA	Channel A Out-of-Range digital output.
23	DCOB	Channel B Data Clock digital output.
24	DCOA	Channel A Data Clock digital output.
4-9, 25-27, 29-31	DNC	Do Not Connect

## OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MO-220-VMM4

Figure 3. 64-Lead Lead Frame Chip Scale Package [LFCSP\_VQ]  
9 mm × 9 mm Body, Very Thin Quad (CP-64-4)  
Dimensions shown in millimeters

091707-C

## ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD9204BCPZ-80 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZRL7-80 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZ-65 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZRL7-65 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZ-40 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZRL7-40 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZ-20 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204BCPZRL7-20 <sup>1,2</sup>	-40°C to +85°C	64-Lead Lead Frame Chip Scale Package (LFCSP_VQ)	CP-64-4
AD9204Z-80EB <sup>1</sup>		Evaluation Board	
AD9204Z-65EB <sup>1</sup>		Evaluation Board	
AD9204Z-40EB <sup>1</sup>		Evaluation Board	
AD9204Z-20EB <sup>1</sup>		Evaluation Board	

<sup>1</sup> Z = Pb-free part.<sup>2</sup> The exposed paddle is the only GND connection on the chip and must be connected to the PCB AGND.