

**FEATURES**

- 60 MHz grade available (AD9928BBCZ-60)
- Registers similar to AD9920A and AD9990
- Timing generator with 18-channel V-driver
- Serial data output with reduced range LVDS interface
- 1.8 V dual AFE core
- Internal LDO regulators for compatibility with 3 V systems
- Correlated double sampler (CDS) with  $-3$  dB, 0 dB,  $+3$  dB, and  $+6$  dB gain
- 6 dB to 42 dB, 10-bit variable gain amplifier (VGA)
- 14-bit, 40 MHz analog-to-digital converter (ADC)
- Black level clamp with variable level control
- Precision Timing core with  $\sim 390$  ps resolution at 40 MHz
- On-chip 3 V horizontal and RG drivers
- General-purpose outputs (GPOs) for shutter support
- On-chip driver for external crystal
- 128-ball CSP\_BGA package, 9 mm  $\times$  9 mm, 0.65 mm pitch

**APPLICATIONS**

- High speed digital imaging
- Surveillance cameras
- Industrial cameras

**GENERAL DESCRIPTION**

The AD9928 is a highly integrated CCD signal processor for digital still-image camera applications. It includes a dual analog front end with analog-to-digital conversion, combined with a full-function, programmable timing generator and an 18-channel vertical driver (V-driver) for a 2-channel output CCD. The timing generator is capable of supporting up to 24 vertical clock signals internally, and the on-chip V-driver supports up to 18 high voltage outputs. A Precision Timing® core allows adjustment of high speed clocks with approximately 390 ps resolution at 40 MHz operation. The AD9928 also contains seven general-purpose outputs, which can be used for shutter and system functions.

Each analog front end includes black level clamping, CDS, VGA, and a 14-bit ADC. The timing generator provides all the necessary CCD clocks: RG, H-clocks, V-clocks, sensor gate pulses, substrate clock, and substrate bias control.

The AD9928 is specified over an operating temperature range of  $-25^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

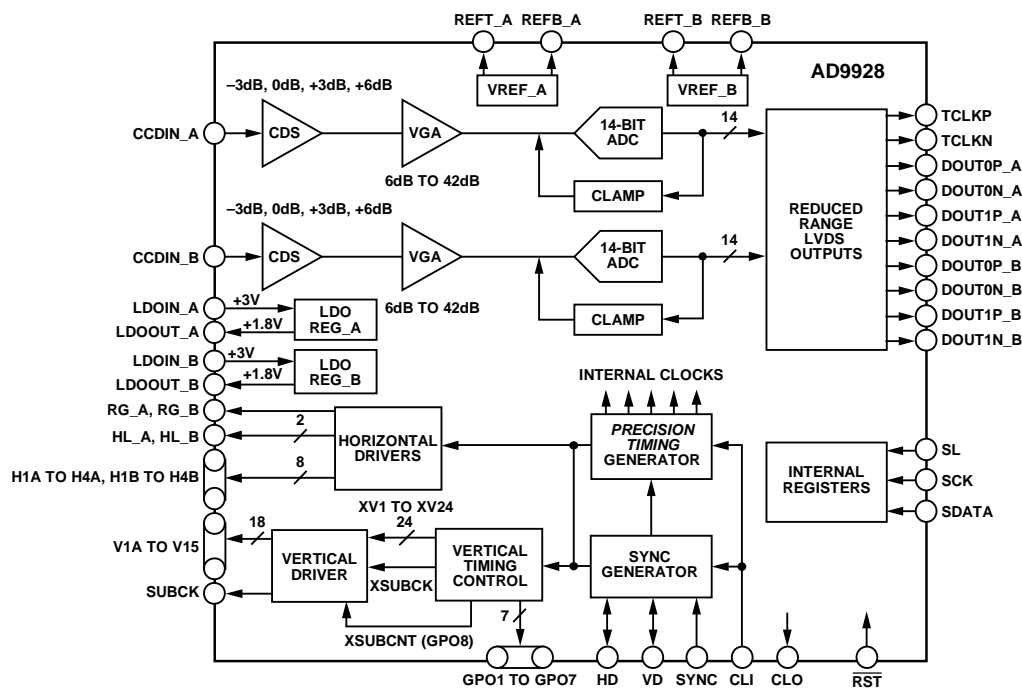
**FUNCTIONAL BLOCK DIAGRAM**


Figure 1.

For more information on the AD9928, email Analog Devices, Inc., at [afe.ccd@analog.com](mailto:afe.ccd@analog.com).

Rev. SpH

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Last Content Update: 11/01/2016

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### Data Sheet

- AD9928: Dual-Channel, 14-Bit CCD Signal Processor with V-Driver and Precision Timing Generator Data Sheet

## [Design Resources](#)

- AD9928 Material Declaration
- PCN-PDN Information
- Quality And Reliability
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**NOTES**