

## 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

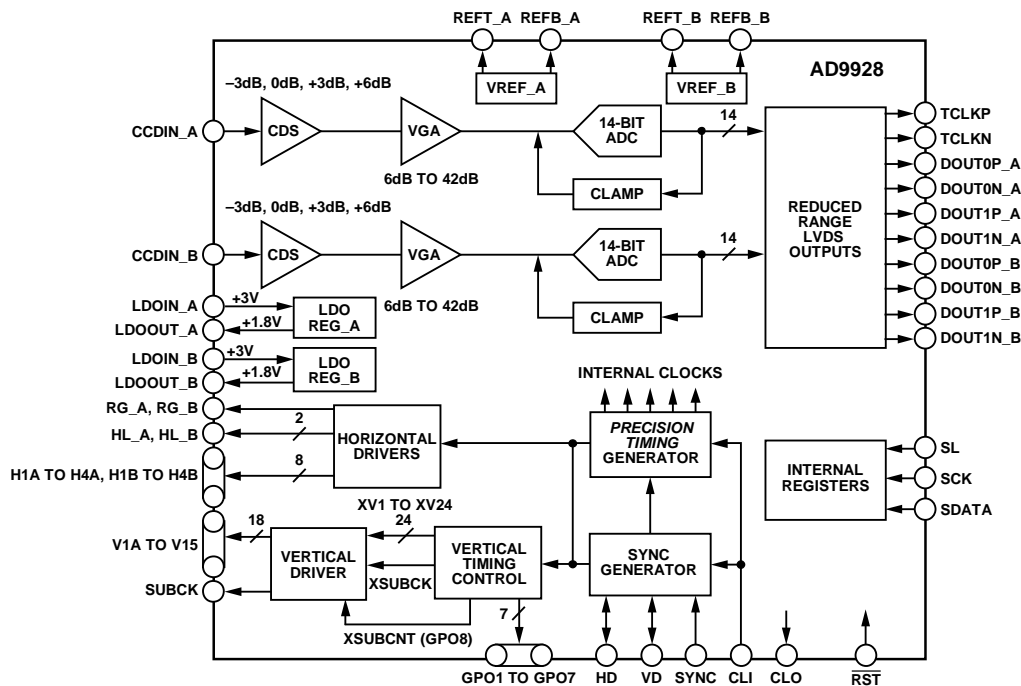


Figure 1.

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

Rev. SpH

Document Feedback

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.  
 Tel: 781.329.4700 ©2009–2013 Analog Devices, Inc. All rights reserved.  
 Technical Support [www.analog.com](http://www.analog.com)

**NOTES**