

CXA3796N CCD Camera Head Amplifier with High-Gain/Low-Noise Amplifier



There are increasing needs for security cameras that support nighttime imaging.

Sony has now developed the CXA3796N CCD camera head amplifier that is optimal for this sort of low-illumination imaging.

This new product is pin compatible with the existing CXA2096N, and now allows the maximum gain and the negative gain to be set externally.

By achieving even lower noise than the CXA2096N, the CXA3796N allows Sony to provide an optimal solution not only for CXA2096N users, but for all users concerned with low-illumination imaging.

- Expanded input dynamic range
- Low-noise/high-gain AGC amplifier
- Supports switching of the AGC amplifier maximum gain and negative gain
- Blanking function
- CDS clamp function
- Sample-and-hold and reference voltage output functions

Pin Compatibility with the Existing CXA2096N

The CXA3796N is a bipolar IC that was developed as a CCD camera head amplifier appropriate for low-illumination imaging with security cameras and similar products. After applying noise exclusion by correlated double sampling (CDS) to the pixel output signals from the CCD, the signals are amplified with an automatic gain control (AGC) amplifier and output to the A/D converter in the DSP in the later stages of the system.

The block diagram of the CXA3796N includes the CDS circuit, the AGC amplifier for the CCD output signal, a camera sample-and-hold (S/H) circuit for the external A/D converter, A/D converter reference voltage output circuits, and a CCDLEVEL output circuit for monitoring. (See figure 1.) The CXA3796N is pin compatible with the existing CXA2096N,

and can directly replace that device with no changes. (The MAXGAIN and GAINSHIFT pins correspond to NC and PS (Power Save) pins in the CXA2096N, and operate in CXA2096N mode when the CXA3796N replaces the CXA2096N with no changes to the application circuit.)

Nine Gain Curves

Any of nine gain curves can be selected by the voltages applied to the MAXGAIN and GAINSHIFT pins. (See table 1 and figure 2.) Since the CXA3796N is designed in particular to also handle negative gains, it can provide a long-desired and effective solution to the color rolling phenomenon.

Noise Reduced by 4 to 5 dB

The AGC amplifier circuit structure was revised in the CXA3796N to achieve noise reduction. The inclusion of a blanking function that disables the CCDLEVEL output during blanking also contributes to reduced noise. Figure 3 shows the gain and output noise characteristics. When compared at the same 26 dB gain, the CXA3796N provides a noise reduction effect of 4 to 5 dB. (Note: This value differs depending on the camera system.)

Black Level Set by CDS Clamping

While the CCD pixel outputs have large differences in the DC levels due to temperature, sample-to-sample variations, and

other factors, the CXA3796N can continuously match this DC level to a reference voltage black level using the externally provided CLPDM signal. This makes it possible to always maintain a fixed black level even under different usage conditions.

Since an A/D converter is connected to the CXA3796N in the following stages, the CXA3796N output includes a sample-and-hold function that is applied to each pixel. This reduces problems such as signal degradation due to inadequate settling.

Low-Illumination Imaging

Photograph 1 shows an example of imaging using this device. Excellent images can be obtained even under low illumination due to the reduced noise.

V O I C E

This IC is a CCD security camera head amplifier. Security cameras are required to produce bright and clear images even in dark places and at dark times of day. To respond to those needs, we achieved even higher gain and lower noise characteristics than in existing products. In the low-noise design, it was particularly important to suppress noise in the signal lines from the input to the AGC, and all the members of the development team worked together as a group on the low-noise design for the S/H and AGC circuits. I strongly recommend that you consider this product.

Figure 1 Block Diagram

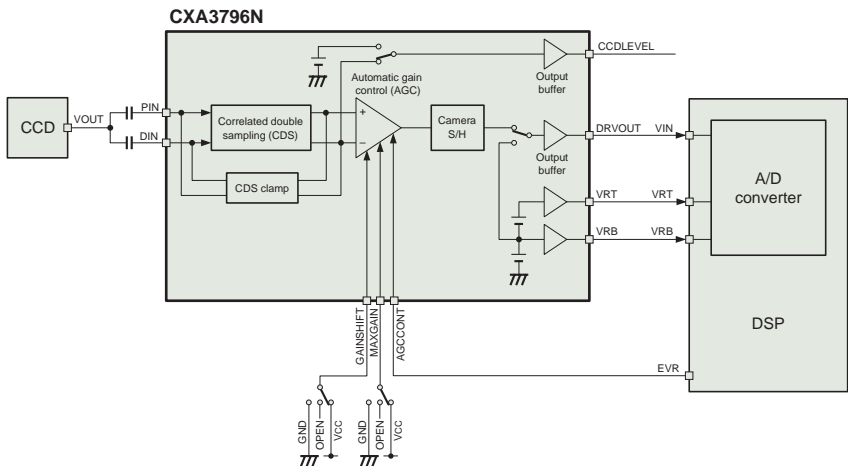


Figure 2 Gain Curves (when GAINSHIFT = Vcc)

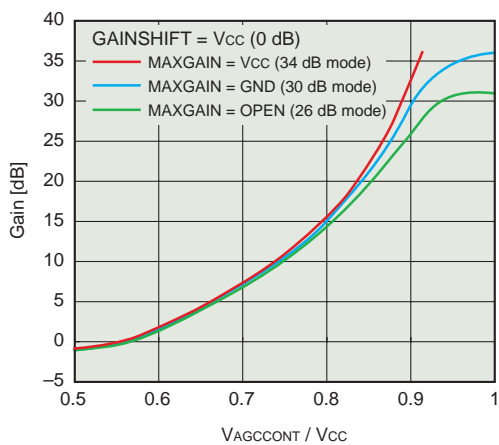
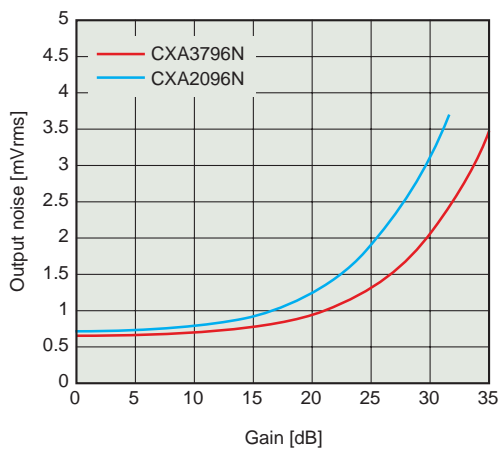


Figure 3 Gain vs. Output Noise



Photograph 1 Imaging Example



CXA3796N (1000lx, F5.6, 1/60 s, 34 dB mode)

Table 1 MAXGAIN and GAINSHIFT Settings

MAXGAIN	GAINSHIFT	Gain
Vcc	Vcc	0 dB to 34 dB
	OPEN	-3 dB to 31 dB
	GND	-6 dB to 28 dB
GND	Vcc	0 dB to 30 dB
	OPEN	-3 dB to 27 dB
	GND	-6 dB to 24 dB
OPEN	Vcc	0 dB to 26 dB
	OPEN	-3 dB to 23 dB
	GND	-6 dB to 20 dB