The Industry's First Single-Chip with 3-Channel Amplifier + A/D Converter + PLL

CXA3506R (8-bit 120 MSPS 3ch Amplifier & A/D Converter, PLL)
CXA3516R (8-bit 165 MSPS 3ch Amplifier & A/D Converter, PLL)

Based on the know-how gained in developing the CXA3246Q, CXA3256R, CXA3276Q, and CXA3286R single-channel A/D converters and the CXA3106Q/AQ and CXA3266Q PLL devices, which have a proven track record as the analog input interface for LCD monitors and LCD projectors, Sony has now succeeded in integrating these together with amplifiers and a sync separator circuit on the same chip to create the CXA3506R and CXA3516R, which handle YUV signals.
These devices allow the circuit board mounting area to be reduced and simplify circuit design of the interconnections between chips in the end product.
These devices can also be used to implement digital TV interfaces.

- **Package: 144-pin LQFP**
- **Supply voltages: 5 V, 3.3 V**
- **3-channel 8-bit 165 MHz A/D converter**
- **Supports UXGA input**
- **Five A/D converter output modes**
- **RGB and YCbCr inputs**
- **Switching between the two input systems**
- **Amplifier monitor output**
- **Main and sub contrast controls**
- **Sub-brightness control**
- **VCO counter: 12 bits**
- **Clock delay: 1/32 to 40/32 CLK signal cycles**
- **Low jitter**
- **Supports both I²C and 3-wire bus serial communication**

Simple Circuit Board Design

These products significantly simplify end product circuit board design by integrating a 3-channel A/D converter and a PLL circuit on a single chip. Furthermore, they also integrate switching between two input systems and a sync separator circuit on the same chip. While the performance of earlier systems that operated in high-frequency bands was influenced by the circuit board design for the connections between the multiple individual ICs, these products allow end products that take full advantage of the performance provided by the ICs to be designed easily and quickly, since these ICs integrate all this functionality on a single chip. The CXA3506R and CXA3516R also include two low-crosstalk input systems for even easier circuit board design.

165 MSPS (CXA3516R)

For its A/D converter, the CXA3516R adopts the circuit used in the CXA3286R and thus achieves the industry's highest conversion rate of 165 MSPS. This allows the CXA3516R to handle even UXGA input signals, and thus supports the implementation of end product designs that support a wide range of input signals. The excellent linearity and low error rate provided by this device allows applications to provide exceptional image quality.

High-Performance Amplifiers

To allow the input signals to be faithfully converted to digital, these ICs transfer signal at high speeds with excellent waveform response characteristics with no ringing. Clamp modes that support YCbCr signals as well as RGB signals are provided, thus simplifying system design. These products also allow either the output of the switch that selects between the two input systems or the amplifier output to be monitored externally as an analog waveform.

Low Jitter

For their PLL circuit, these products adopt the circuit used in the CXA3266Q, and thus generate clock signals with good temperature stability and low jitter for a wide range of signals. This allows high-quality images with minimum noise to be created. (–10% as compared to the CXA3266Q)

Low-Crosstalk Switch

The switching function, which was previously implemented with external ICs, is now integrated on the same chip. This significantly eases end product design and provides high-performance input signal switching with excellent crosstalk characteristics.

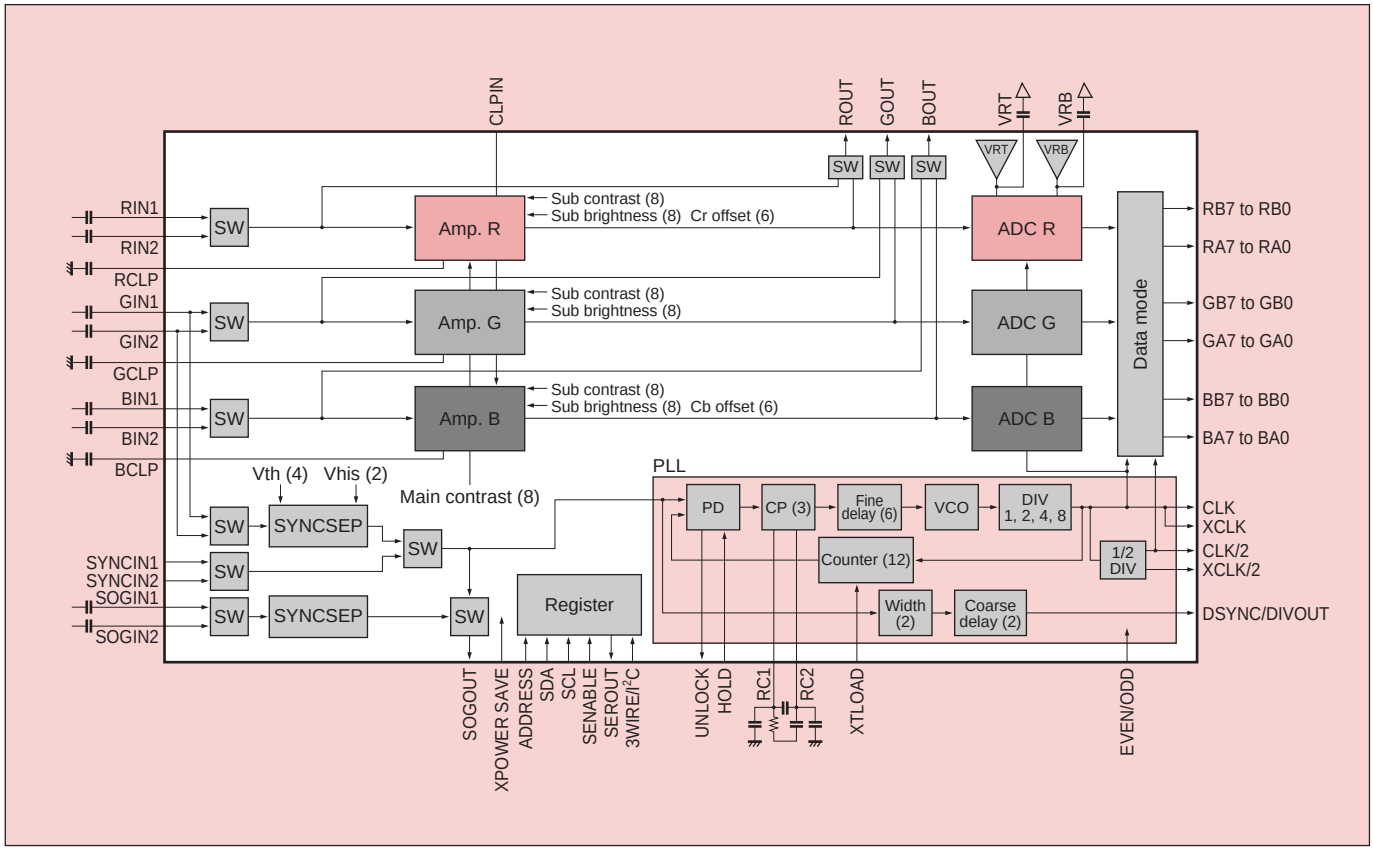
Five A/D Converter Output Modes

While it goes without saying that these devices provide two port demultiplexed outputs for the RGB or YCbCr input, they can also provide a YUV422 output. Thus they can handle a wide range of signals and be used not only in LCD monitors and LCD projectors, but in digital TV systems as well. Furthermore, the TTL output high level can be set with an internal register, and thus these devices can be connected directly to a 3 V scan converter IC.

V O I C E

The time application designers previously spent on inter-IC interface design and assuring that the underlying performance of the ICs involved was actually delivered by the application is largely eliminated by these products, the CXA3506R and CXA3516R. We have developed high-performance easy-to-use devices that meet our customers' needs.

New Products



■ **Figure 1 CXA3506R and CXA3516R Block Diagram**

■ **Table 1 Maximum Conversion Rates**

CXA3506R	120 MSPS
CXA3516R	165 MSPS

■ **Table 2 Input Signals and Output Data Modes**

Input signals	Two input signal systems: R, G, and B signals or Y, Cb, and Cr signals
	Two sync pulse input systems
	Two green input systems with sync signals for the sync separator circuit
	Clamp pulse input
	Hold pulse input for the PLL circuit
A/D converter output signals	Straight mode (8 bits × 3 channels)
	Demultiplexer simultaneous phase mode (8 bits × 2 ports × 3 channels)
	Demultiplexer alternating phase mode (8 bits × 2 ports × 3 channels)
	YUV422 D2 mode (8-bit Y + 8-bit UV signals)
	YUV422 special mode (8-bit Y + 8-bit UV signals)
	Even/odd alternate sampling mode (Supports signals with a frequency twice that of the inputs)

■ **Table 3 Main Control Register Functions**

Block	Function	Bit	Control range
PLL	Programmable feedback counter control	12	1/256 to 1/4096
PLL	VCO back-end counter control	2	1/1, 1/2, 1/4, 1/8
PLL	Fine delay control	6	1/32 to 64/32CLK
PLL	Coarse delay control	2	3CLK, 4CLK, 5CLK, 6CLK
PLL	Charge pump current D/A converter control	3	100 µA, 200 µA, 300 µA, 400 µA, 500 µA, 600 µA, 700 µA, 800 µA
PLL	Delay sync pulse width control	2	1CLK, 2CLK, 4CLK, 8CLK
PLL	Delay sync delay control	1	4CLK, 5CLK
AMP	Main contrast	8	Mgain = ×0.7 (Typ.) to ×3.0 (Typ.)
AMP	Sub-contrast R channel	8	Mgain = ×0.75 (Typ.) to ×1.25 (Typ.)
AMP	Sub-contrast G channel	8	Mgain = ×0.75 (Typ.) to ×1.25 (Typ.)
AMP	Sub-contrast B channel	8	Mgain = ×0.75 (Typ.) to ×1.25 (Typ.)
AMP	Sub-brightness R channel	8	VRB – 64LSB to VRB + 64LSB
AMP	Sub-brightness G channel	8	VRB – 64LSB to VRB + 64LSB
AMP	Sub-brightness B channel	8	VRB – 64LSB to VRB + 64LSB
AMP	YUV mode, Cb input clamp level adjustment	6	128LSB – 16LSB to 128LSB + 16LSB
AMP	YUV mode, Cr input clamp level adjustment	6	128LSB – 16LSB to 128LSB + 16LSB
SYNC SEP	Sync-on-green mode, sync separator circuit hysteresis level adjustment	2	0%, 20%, 40%, and 60% of 286 mV
SYNC SEP	Sync-on-green mode, sync separator circuit threshold level adjustment	4	15% to 90% of 286 mV in 5% steps
TTLOUT	TTLOUT CLP level	2	2.25 V, 2.50 V, 2.75 V, 3.00 V