ZLAN-290

Zarlink Analog Switches Suit a Variety of Applications

Application Note

Contents

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1.0 Introduction

Like all monolithic analog switches, the Zarlink MT88xx family of analog switches exhibits resistive characteristics when turned on. Most applications will not be adversely affected by the ON resistance or its variations with these parameters. In some systems and applications with more stringent specifications, special considerations may be required. In cases such as driving through the switches into low impedance loads, or using the device in a gain control circuit, it becomes necessary to consider the switch resistance in design equation.

Other Zarlink analog switches characteristics can be summarized as follows;

- Transparent and bi-directional switch with low on resistance
- Capable of passing analog signal, digital signal and DC voltage
- 12Vp-p analog signal capability
- DC to 45 MHz bandwidth
- Full CMOS switch for low distortion
- Wide operating voltage range from 4.5 V to 13.5 V

Traditionally, Zarlink analog switches have been used primary in Telecom applications. However, the unique characteristic mentioned above also makes Zarlink analog switches suitable for a wide variety of applications as follows.

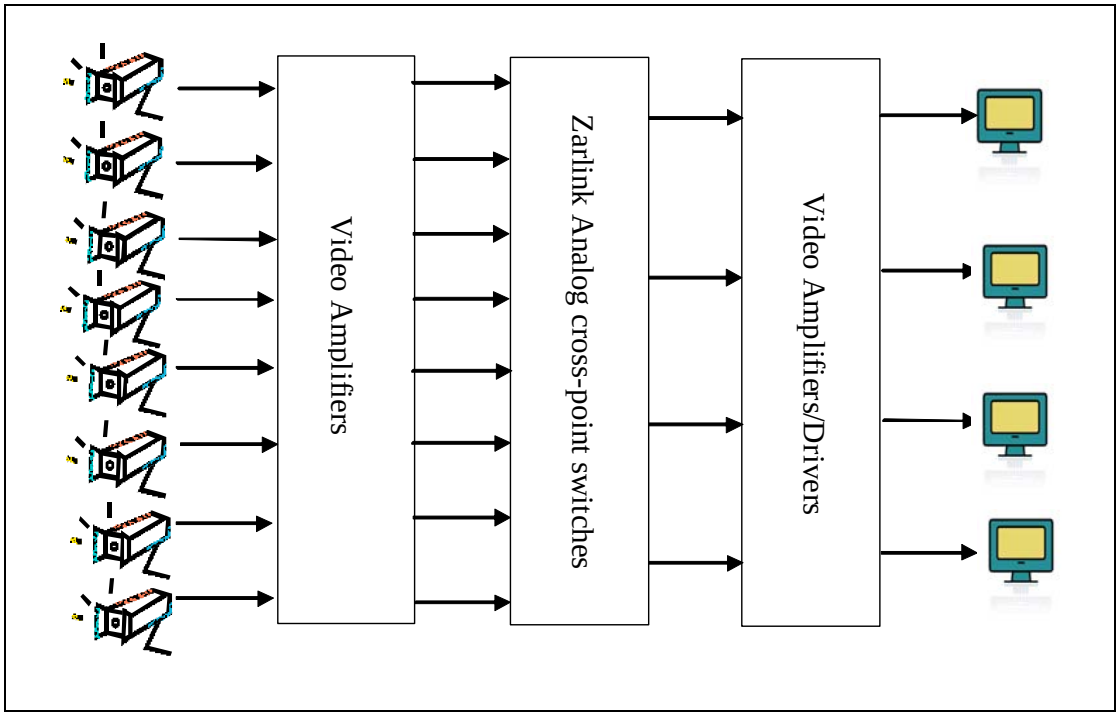

Figure 1 - Typical Video Surveillance Systems

2.0 Closed Circuit TV Application

Figure 1 shows a typical closed circuit TV system using Zarlink analog cross-point switches. Analog cross-point switches allow multiple video sources switched to multiple output devices, e.g., video monitor, video recorder etc. External video amplifiers are required as the input buffers and output buffers to drive the video loads.

The reference design shown in Figure 2 utilizes the CLC2005, CADEKA dual channel video amplifier, and the MT8816, Zarlink 8 x 16 analog switch array. Both operate from a single 5 V supply providing a significant competitive advantage versus many ±5 V solutions used today. The CLC2005 is used to buffer the inputs of the MT8816 and to provide gain and drive capability for each MT8816 output. Each channel of the CLC2005 can drive 3 video loads allowing for increased system capability. The MT8816 offers designers ease-of-use and flexibility by providing 16 inputs that can be switched to any of the 8 outputs or 8 inputs that can be switched to any of the 16 outputs.

The reference design provides video surveillance system designers a low cost solution with performance that exceeds the requirements of standard definition video. For full scale video, the reference design offers -0.3 dB bandwidth of 4 MHz, -1 dB bandwidth of 10 MHz, -3 dB bandwidth of 35 MHz, differential gain/phase of 0.16%/0.33°, and signal-to-noise ratio better than 90 dB. A FT245R USB FIFO from Future Technology Devices International (FTDI) provides a standard USB interface for a PC. Through this USB connection the PC controls the programming of the switching system.

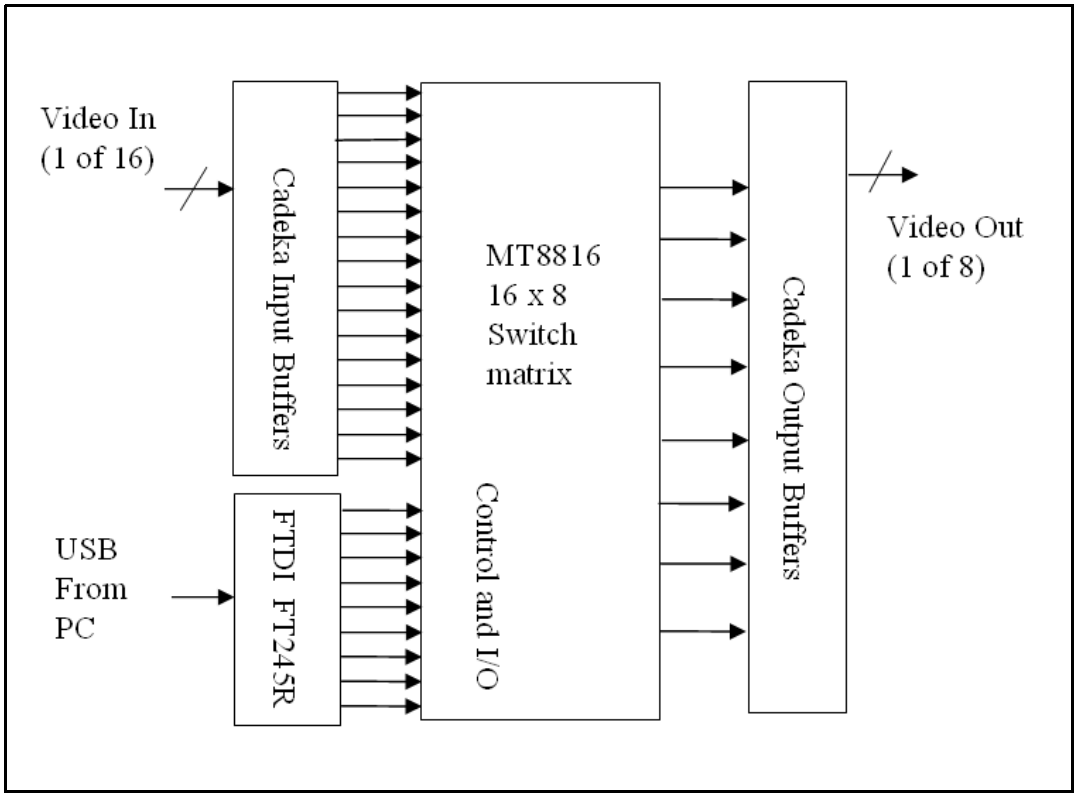

Figure 2 - Block Diagram of a 16 x 8 Video Switch Matrix

A detailed video interface circuit is shown in Figure 3. On the input side, R15 sets a 75 ohm input termination for the video camera. And operational amplifier X7 is biased to sit at a DC voltage of 1.25 V. The gain of the output video amplifier is set at 6 dB such that the DC bias at the output will be at the optimum voltage of 2.5 V. R 9 provides a 75 ohm output impedance to match the video monitor input impedance

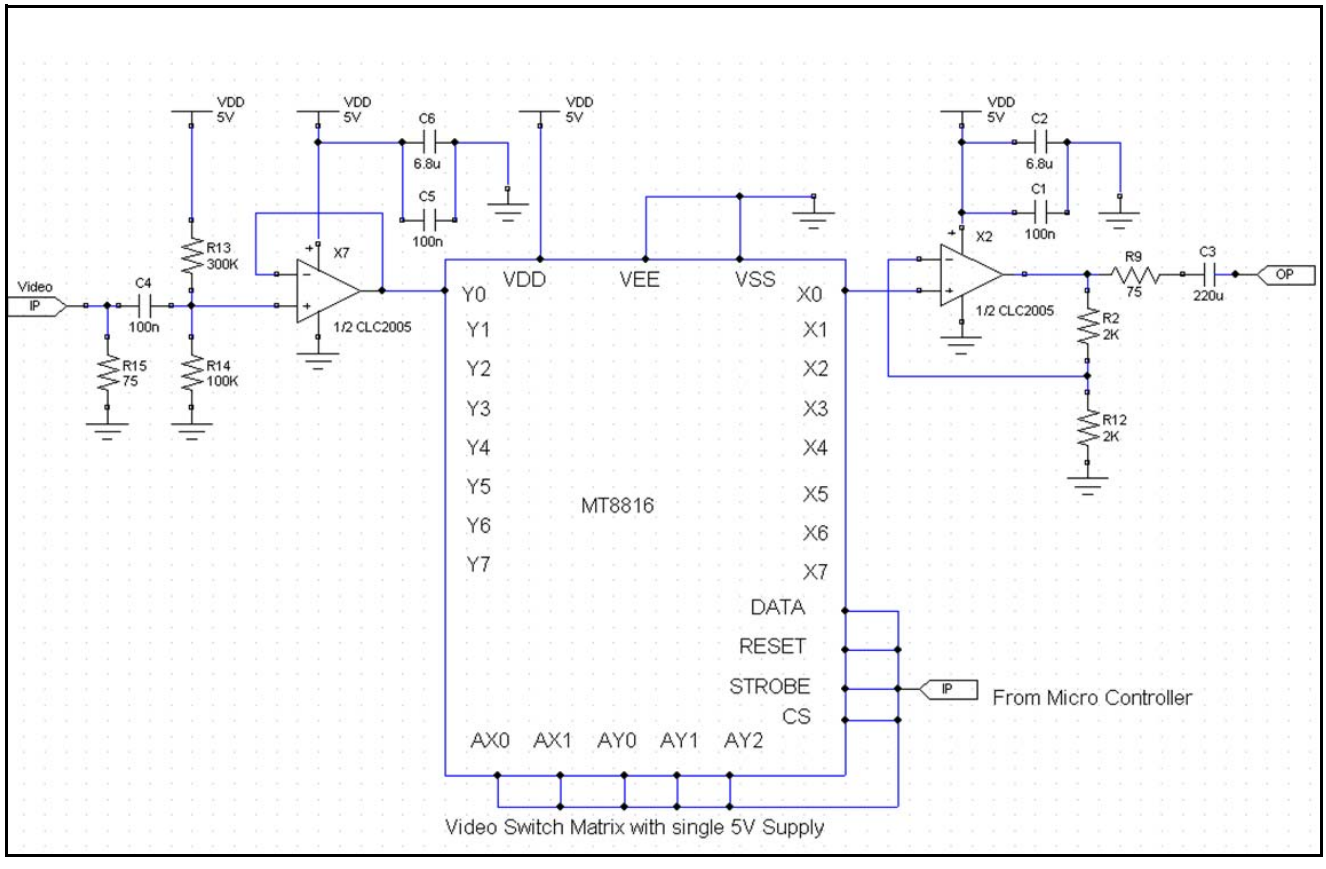

Figure 3 - Detail Circuit of the Video Interface

3.0 Industrial Application

Figure 4 shows a typical application of the MT8816 in a factory environment where the MT8816 could be used in a remote control room. Basically, part of the MT8816 switch array is used to support a closed circuit TV system. Cameras should be installed in all locations where human access is limited. Other part of the MT8816 could be used to connect up certain system test points to different electronic measurement equipment. For example, the system test points could be part of the furnace of the smelter where temperature, electrical operation detail could be connected to the thermometer, voltmeter or oscilloscope of the remote control panel. When abnormal conditions are detected, the remote control panel would then connect control voltages to the factory floor, e.g., shutting down the furnace that display elevated temperature, and also turn the alarm on.

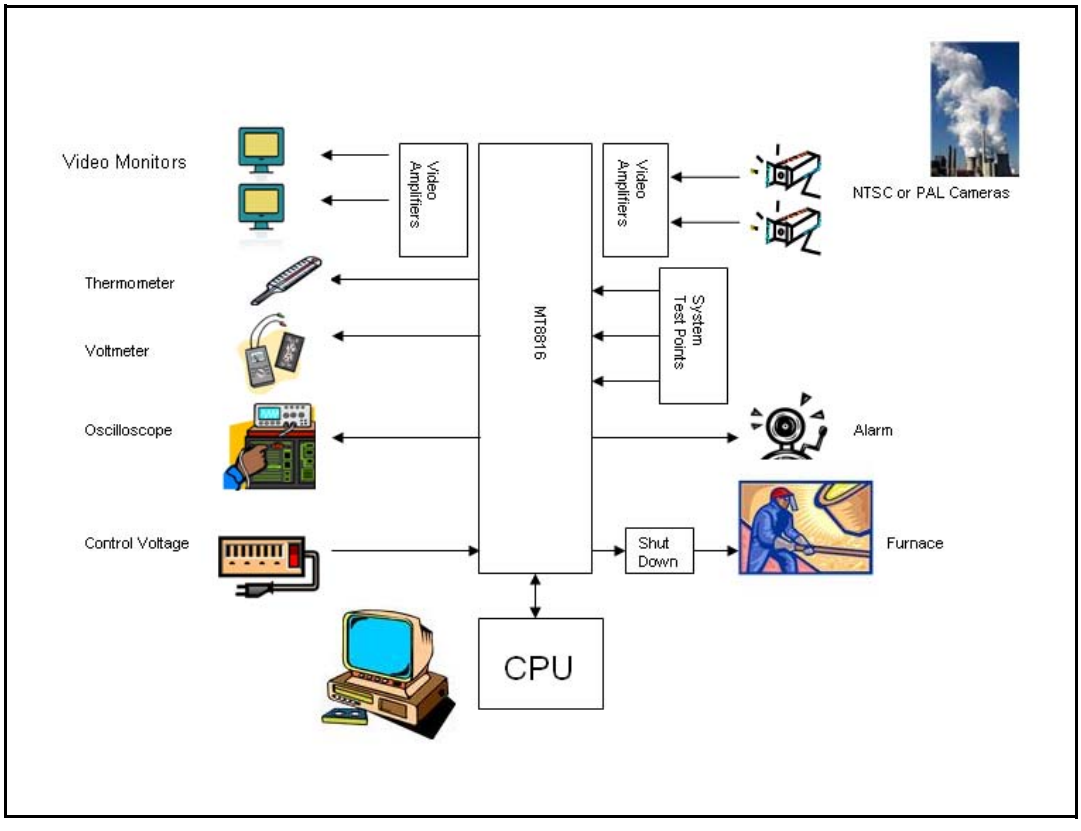

Figure 4 - A Steel Mills Remote Monitor/Control System

4.0 Musical Studio Applications

4.1 Audio Mixer Circuit Operation

A simple dual mixer is shown in Figure 5. Eight different audio sources are connected at the inputs Y0 to Y7. Outputs X0 to X4 are connected to operational amplifier x3 as a four inputs summing amplifier. Outputs X4 to X7 are connected to operational amplifier x4 as another 4 inputs summing amplifier. A micro-controller is used to select any 4 of audio inputs for the mixers. To reduce gain error due to the switch ON resistance, 100 K ohms are used for gain setting.

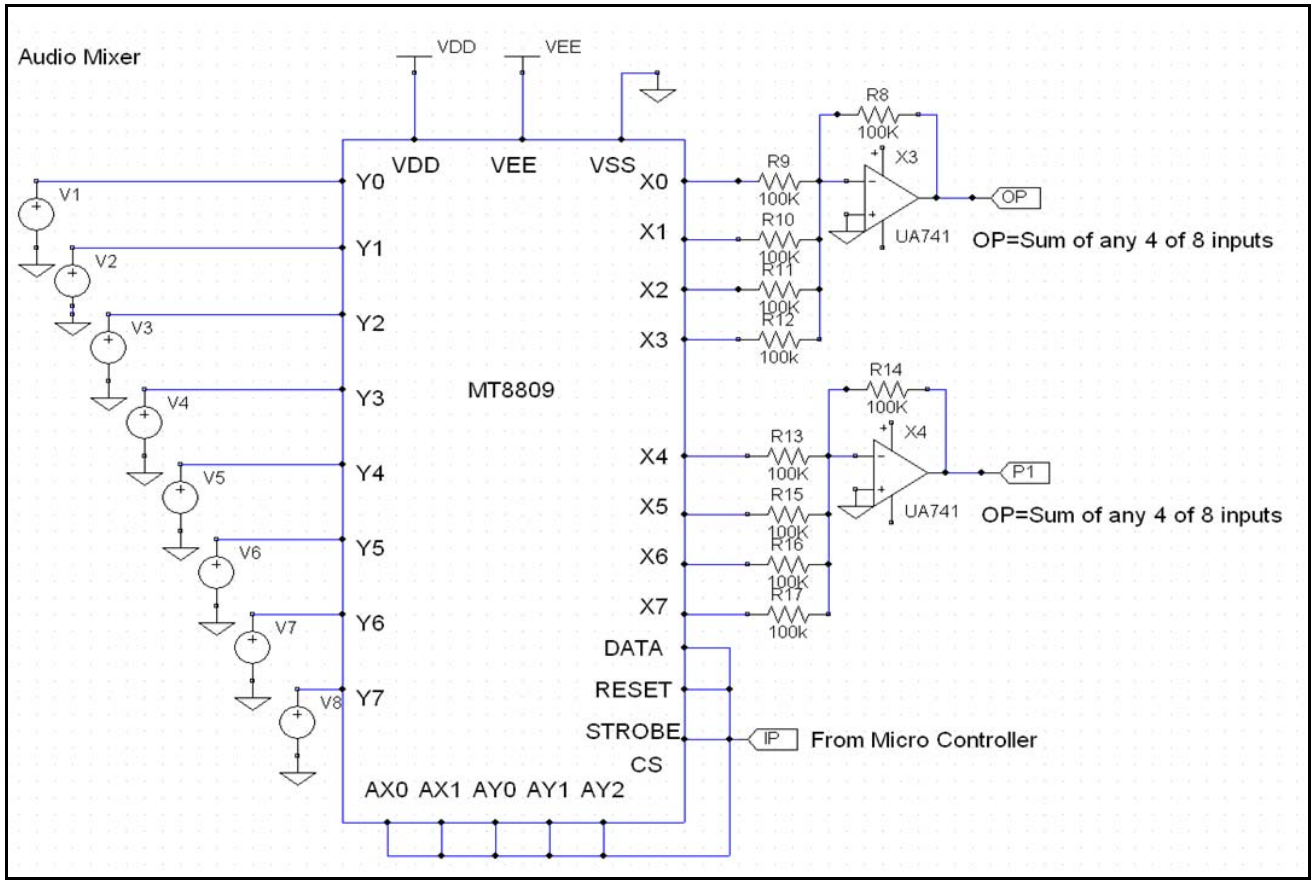

Figure 5 - Audio Mixer

4.2 Programmable Attenuator Circuit Operation

The programmable attenuator shown in Figure 6 is capable of providing up to -61 dB of attenuation or 20 dB of gain. Selecting the input attenuation is accomplished via the address inputs AY0, AY1, and AY2 and can be chosen in 3 dB step. Selecting the output gain is accomplished by the address inputs AX0 and AX1. The range is selected in 20 dB steps by connecting an attenuated input signal (Y0 to Y7) onto the appropriate outputs (X0 to X3). The attenuated input signal is buffered after passing through the switch to eliminate the gain error introduced by the ON resistance and also provide low output impedance to the summing amplifier X3.

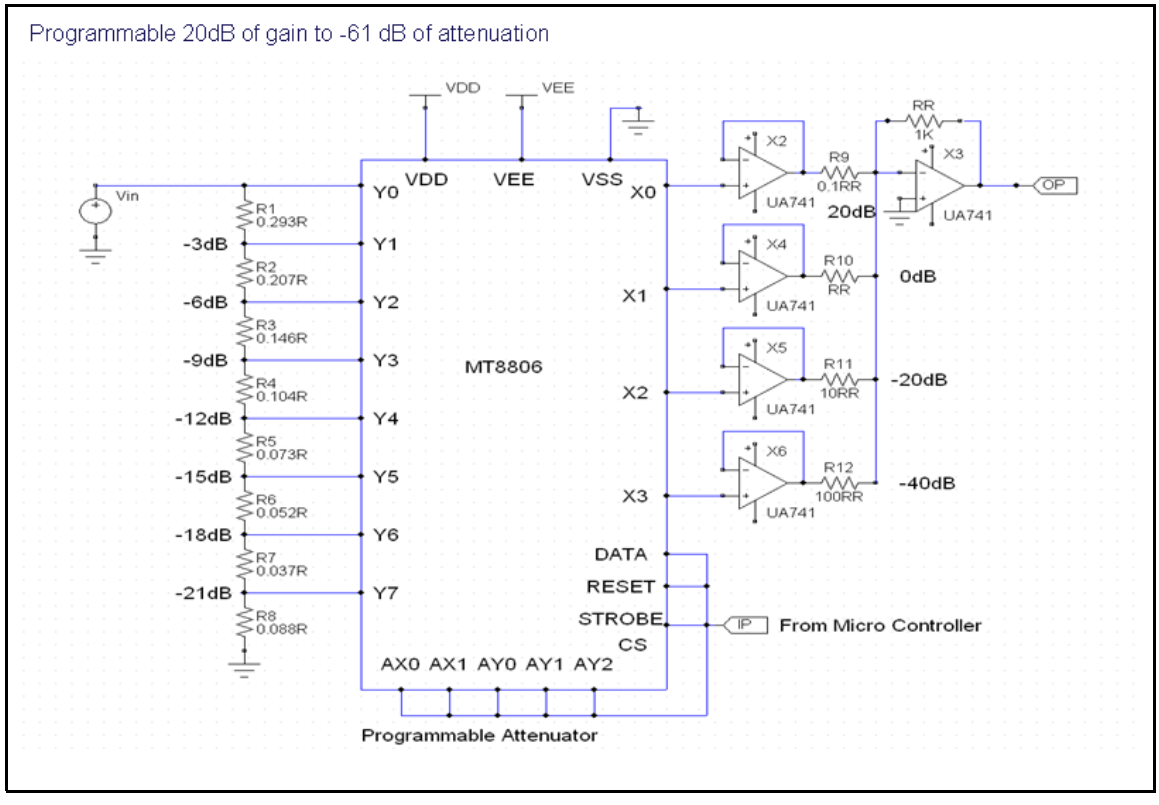

Figure 6 - Programmable Gain/Attenuation

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