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High-Performance CMOS Analog Switches

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APPLICATION NOTE

INTRODUCTION

Eleven new devices have recently been introduced by ON Semiconductor, adding to its large array of analog switches, already available. The new devices are offered in multi-gate and one-gate configurations. This latest offering entails a low-resistance, high frequency response product, providing improved performance for a lower cost to the designer.

Less than 15-Ohms Resistance

The eleven new analog switches include the MC74LVX4066, 8051, and 8053; their TTL-Compatible versions – MC74LVXT4066, 8051, and 8053; two new one-gate devices – M7CVHC1G66 and 1GT66; and three new VHC products – the MC74VHC4051, 4052, and 4053. The new devices compliment the standard offering of analog switches, multiplexers, and demultiplexers.

Designed as either a single-voltage supply from two to six volts for the standard parts or five volts for the TTL-compatible “T” versions, the additions will suit many applications. Typical resistance values are less than 15 ohms for many of the devices when operating at five volts compared to the industry-standard of 80 ohms to 100 ohms. The multi-gate products are available in both 16-lead SOIC, as well as TSSOP packages, while the single-gate devices are available in industry-standard SC-88a, five-lead packages.

Ideal for Wireless, Analog or Digital

ON Semiconductor’s new high-performance portfolio can be utilized in many diverse, applications and markets, including wireless, computing, and standard telecommunication systems. The devices primarily accomplish the switching, multiplexing, and demultiplexing of both analog and digital signals. Many so-called digital signals are actually quasi-analog in nature, such as frequency shift key (FSK), phase-shift key (PSK), quadrature amplitude modulation (QAM), code division multiplex (CDMA), and time division multiplexing (TDMA). As a result, they need to share the decoding from several different input sources, with minimum distortion to the signal. And in consumer products, switching between two or more analog sources is a constant requirement.

As an example of an application (Figure 1), one of eight sources could be selected to decode for a Dolby Digital or DTS decoder. A stereo receiver would likely have a single audio decoder, but would need to switch between up to eight inputs to be connected to a single (potentially costly) decoder. The demultiplexer is not only low cost, but also minimizes the loss and distortion that is added to the circuit. The frequency required for an example, such as the one pictured, falls in the 10 MHz range.

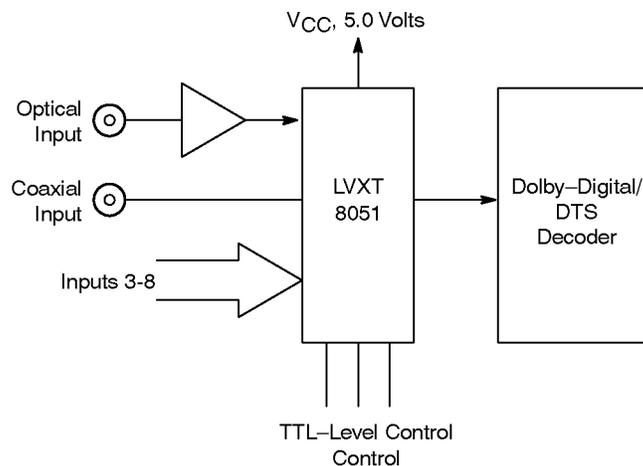


Figure 1.

Very High-Speed CMOS Offerings

Among the eleven analog-switch family additions, ON Semiconductor is offering three new Very High Speed CMOS (VHC) devices – the MC74VHC4051, 4052, and 4053 that provide improved performance over previous offerings. These new VHC devices allow operation with both positive and negative supplies. This feature allows for switching an AC waveform that is centered approximately zero volts with no coupling capacitors.

A ± 3.3 V-supply allows for a 5 V peak-to-peak waveform, with LVTTL/CMOS compatibility. The DC level is preserved for the case of video switching. The VHC4053 is especially ideal for switching beyond 30 MHz. The following diagram (Figure 2) illustrates switching two audio channels from three sources and three video channels simultaneously. The signal levels may be ± 2.5 volts.

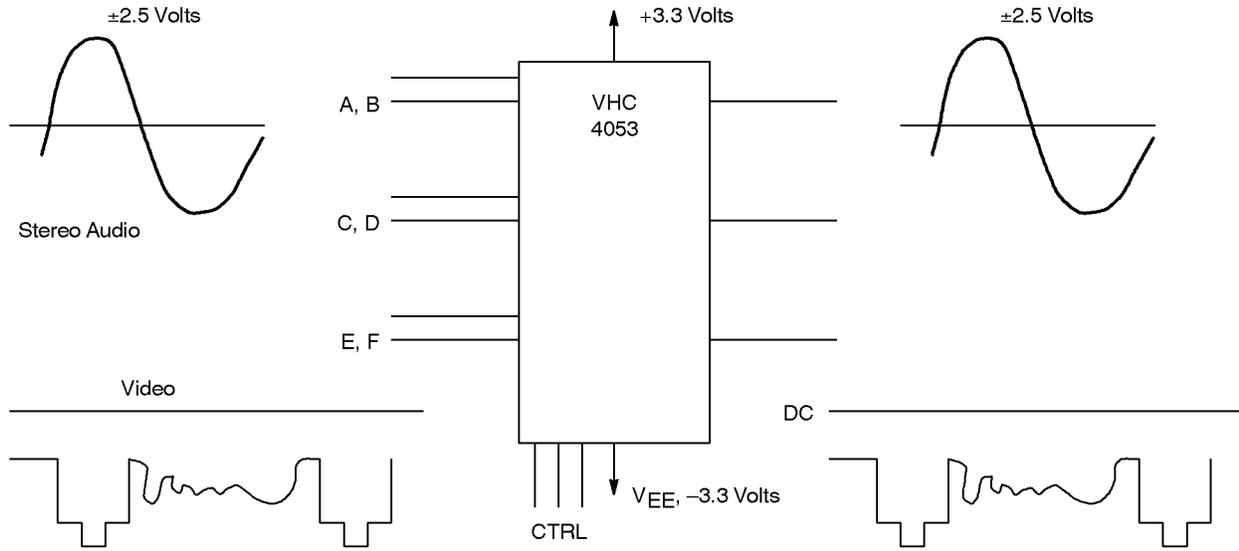


Figure 2.

Two Dynamic New One-Gate CMOS

Two new single-gate products were also introduced into ON Semiconductor’s advanced, sub-micron VHC family – the MC74VHC1G66 and MC74VHC1GT66. These new devices offer a single analog-switch function and

impressive AC-performance levels. Figure 3 illustrates a way to change a time constant in a loop filter application for fast “attack” stable “hold” using the MC74VHC1G66.

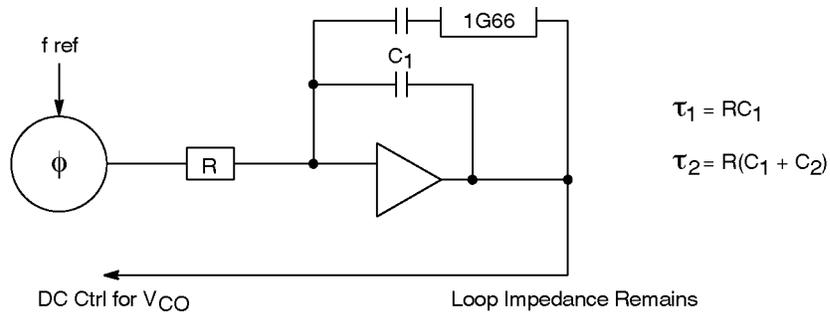


Figure 3.

Notes

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