



## High-Performance CMOS Analog Switches

Prepared by: Fred Zlotnick  
Logic Applications Engineering

### 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.

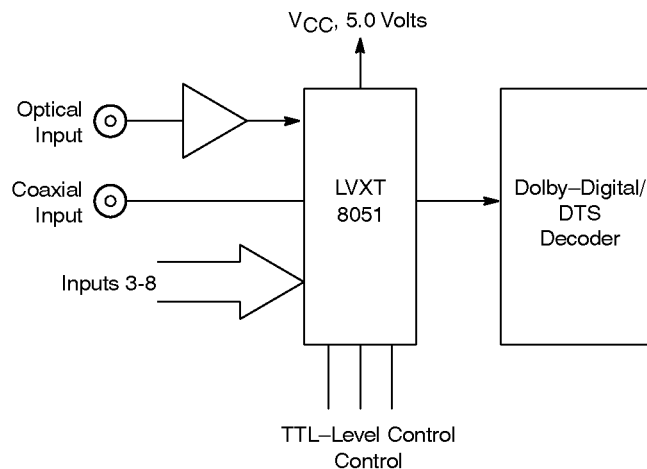


Figure 1.

**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  $\pm 3.3$  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  $\pm 2.5$  volts.

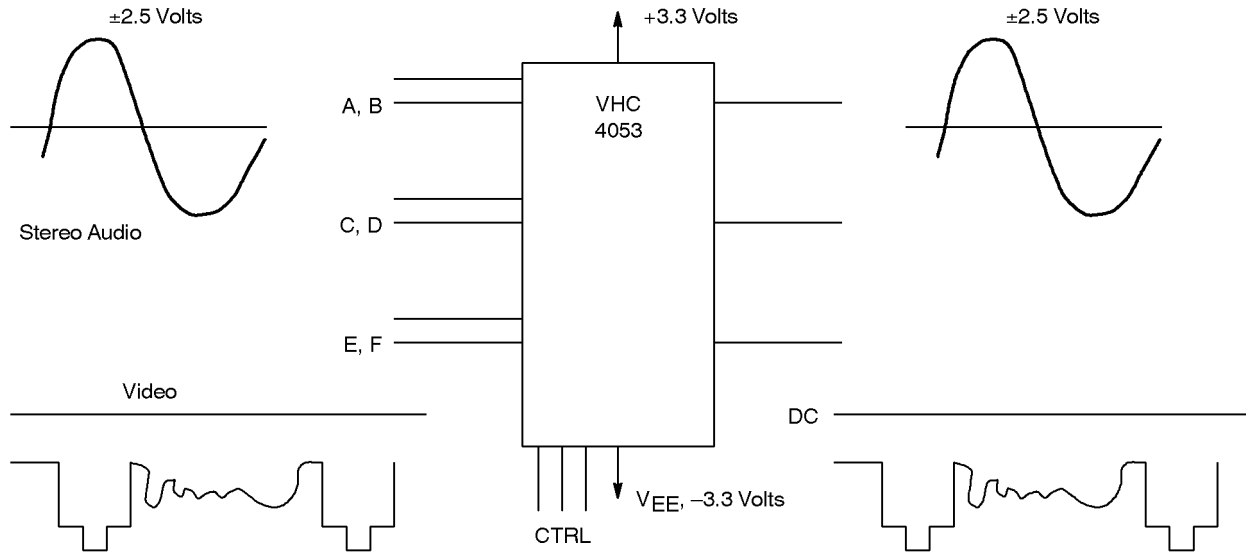


Figure 2.

**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.

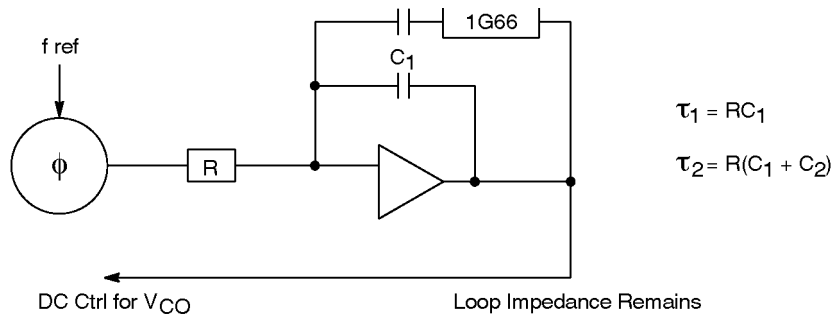


Figure 3.

## Notes

**ON Semiconductor** and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

## PUBLICATION ORDERING INFORMATION

### NORTH AMERICA Literature Fulfillment:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** ONlit@hibbertco.com  
Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

**N. American Technical Support:** 800-282-9855 Toll Free USA/Canada

**EUROPE:** LDC for ON Semiconductor – European Support

**German Phone:** (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)  
**Email:** ONlit-german@hibbertco.com  
**French Phone:** (+1) 303-308-7141 (Mon-Fri 2:00pm to 7:00pm CET)  
**Email:** ONlit-french@hibbertco.com  
**English Phone:** (+1) 303-308-7142 (Mon-Fri 12:00pm to 5:00pm GMT)  
**Email:** ONlit@hibbertco.com

**EUROPEAN TOLL-FREE ACCESS\*: 00-800-4422-3781**

\*Available from Germany, France, Italy, UK, Ireland

### CENTRAL/SOUTH AMERICA:

**Spanish Phone:** 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)  
**Email:** ONlit-spanish@hibbertco.com  
**Toll-Free from Mexico:** Dial 01-800-288-2872 for Access –  
then Dial 866-297-9322

**ASIA/PACIFIC:** LDC for ON Semiconductor – Asia Support

**Phone:** 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)  
**Toll Free** from Hong Kong & Singapore:  
**001-800-4422-3781**  
**Email:** ONlit-asia@hibbertco.com

**JAPAN:** ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031  
**Phone:** 81-3-5740-2700  
**Email:** r14525@onsemi.com

**ON Semiconductor Website:** <http://onsemi.com>

For additional information, please contact your local Sales Representative.