Application Note

AS1750

Analog Switch with internal shunt switches and a comparator

Content Guide

1 Why the internal shunt switches are needed?

Due to the switching between audio sources, audible click-and-pop sounds occur. To reduce these sounds a shunt switch can be implemented and connected to the open terminal of the switch. This shunt switch automatically discharges any capacitance at the open terminal during the OFF state of the switch.

Audible clicks and pops are caused when a step DC voltage is switched into the speaker. By automatically discharging the side that is not connected, any residual DC voltage is removed, thereby reducing clicks and pops.

2 Why the internal comparator is needed?

To be able to implement a mute and headphone function there is the need for an internal comparator. The negative terminal of this comparator should be connected to the outside while the positive terminal should be internally set to some value between GND and VDD. The output of the comparator should be logic high when the negative terminal is below the threshold and logic low when it is above the threshold.

Headphone audio signals are typical biased to VDD/2 so a comparator threshold of VDD/3 is sufficient for the headphone detection.

For the mute function there are two options. One is to connect a negative terminal to GND (mute button is connected – mute is ON), and this would make the comparator output going to logic high, and the second is to connect the negative terminal to VDD (mute button is not connected – mute OFF), and this would make the comparator output going to logic low. So, the threshold of VDD/3 is also ok. This is presented in Fig. 1.

3 Implementation of these features in AS1750

Both functions are implemented in AS1750, as seen in Fig. 1. Typical the value of the shunt resistor is 25 Ohm, and the maximum is 50 Ohm. The Comparator threshold is set to VDD/3, with a switching time of typically 300 ns and a maximum of 400 ns.

Current consumption is typically 5 uA to a maximum of 10 uA, because of the comparator working. The Comparator input leakage is lower than 50 nA.

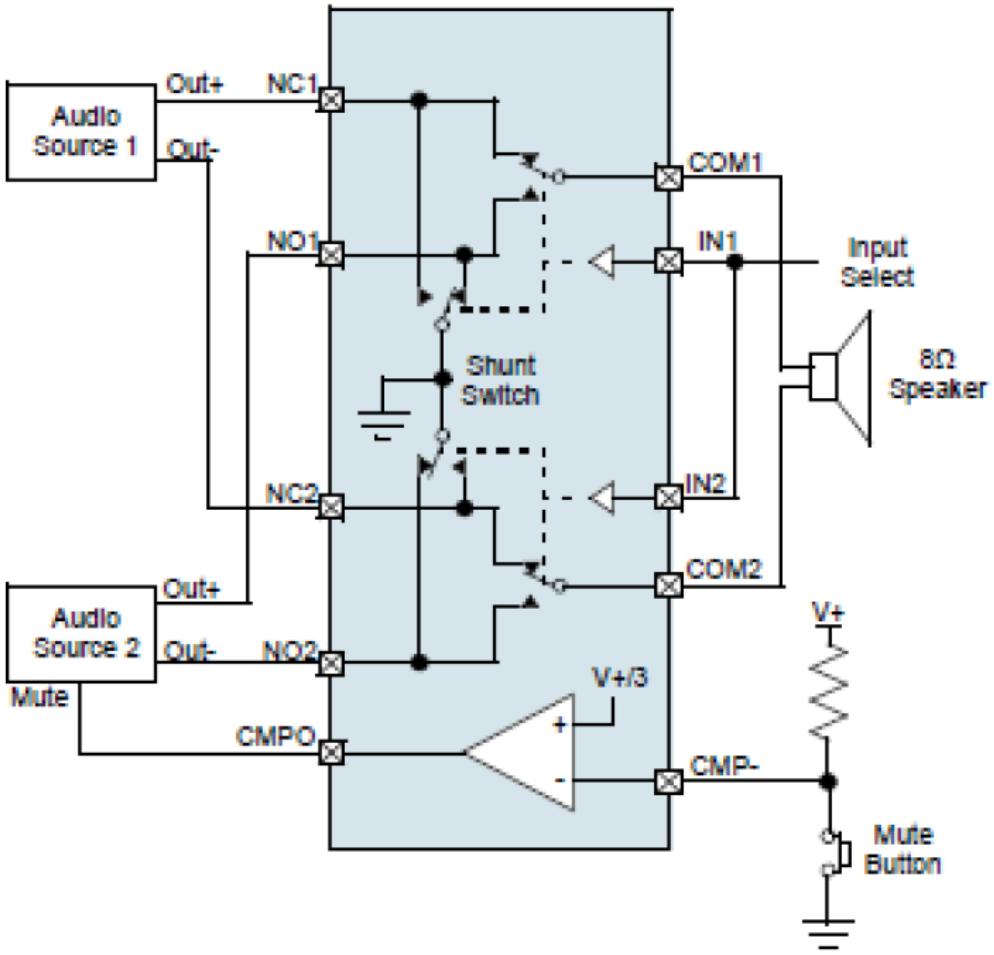

Figure 1: A typical Operating Circuit

4 Results of the comparator

The results of the comparator threshold are presented in Fig. 2 and Fig. 3. It is easy to see that the threshold is very stable at VDD/3 for both supplies 3V and 5V over the whole temperature range.

The difference in switching for the rising and falling signal on the negative terminal is about 30 mV, and provides more stability.

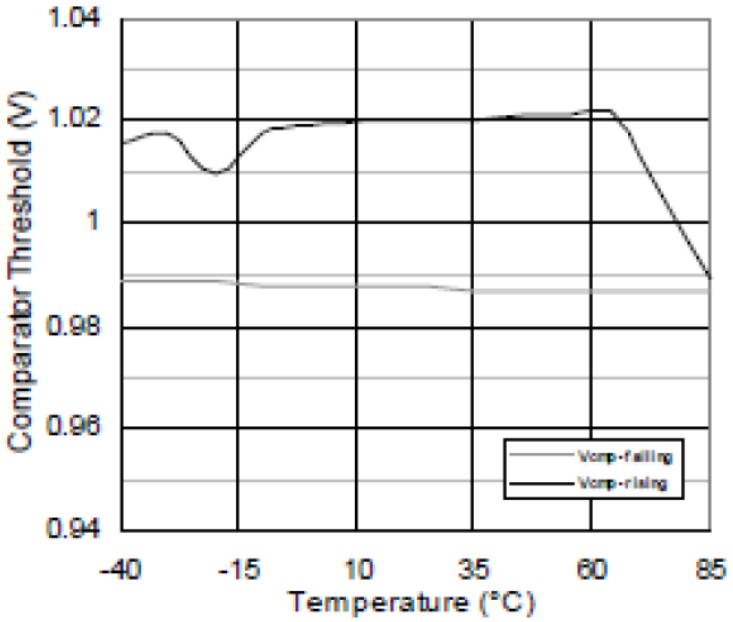

Figure 2: Comparator Threshold vs. Temp., VDD = 3V

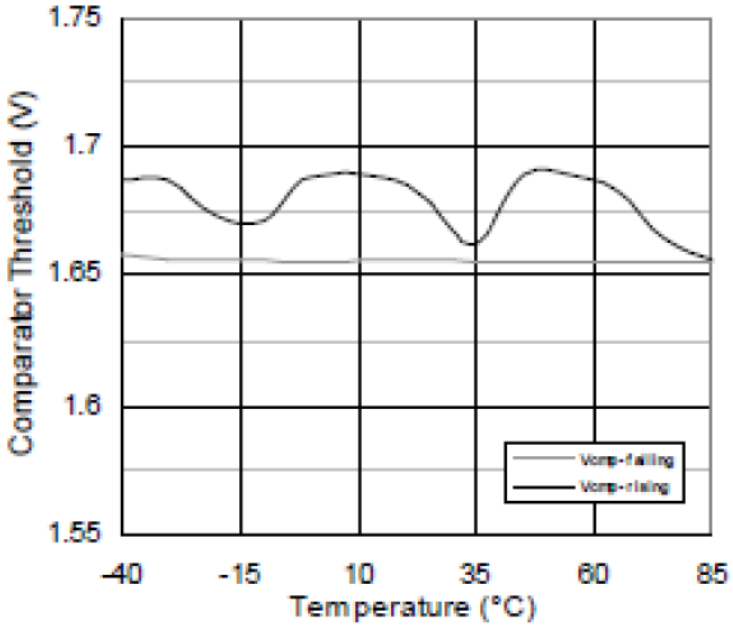

Figure 3: Comparator Threshold vs. Temp., VDD = 5V

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Austria, Europe

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7 Revision Information

Changes from 0.1 to current revision 0-10 (2014-Jul-18)	Page
Content updated to latest ams design	

Note: Page numbers for the previous version may differ from page numbers in the current revision.