Analog Switch in Audio Applications

Using PI5A100 to Replace a Reed Relay

Introduction

Trying to switch high fidelity audio signals from a digital-to-analog converter (DAC) is a difficult problem. Sometimes a "Pop" is heard from the speaker during power down. This brief will show how Pericom's PI5A100 can be used to suppress this noise when the switch is turned off, yet maintain low distortion when the switch is turned on. This analog switch can be used with speaker or headphone. This application is ideal for multimedia digital audio add-on cards (see Figure 2).

Figure 1 shows switches connected in parallel to reduce R_{ON} (attenuation) and increase flatness (or reduce distortion).

Attenuation = 20 LOG R_{ON}/R_L = 20 LOG 5Ω/32Ω = –16dB

Pericom's PI5A100 has one of two inputs grounded, but that input can be connected to another audio source. Each switch channel can handle 5Vp-p or 2.0Vrms while operating from ±5V power supplies. These signals usually drive 10Ω to 30Ω speakers (with built-in power amps). Audio Total Harmonic Distortion is < 0.02%. Dolby AC-3 systems are 6-channel surround-sound cards. The waveform in Figure 3 shows the charge injection of 525mV. Charge injection indicates the amount of energy induced into the audio channel when the switch is turned off. Notice that this unwanted noise can cause a popping sound if noise is excessive, but in this example the noise level is not audible. Hot insertion is allowed when the switch is disabled or ground is selected (see Figure 1).

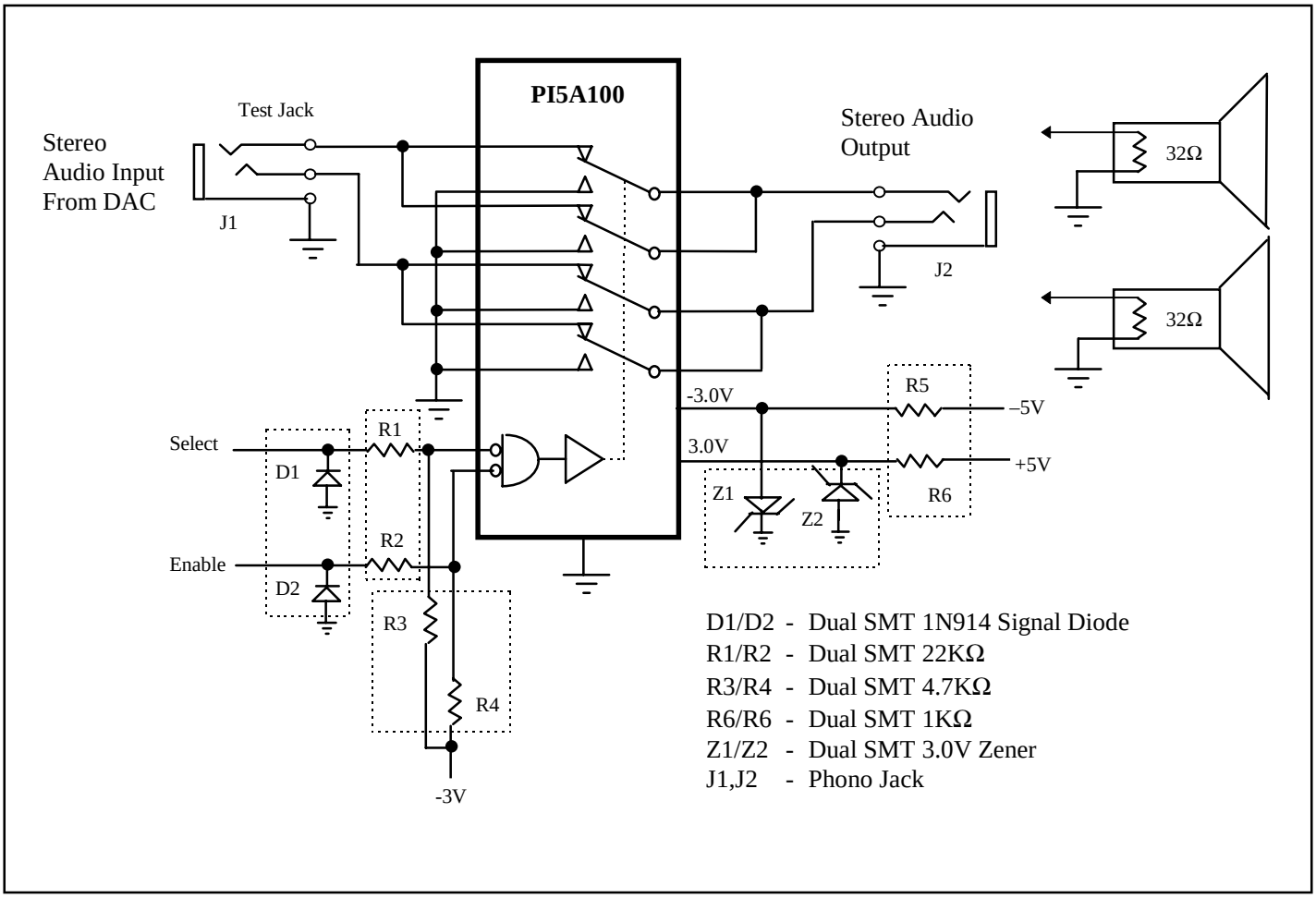

Figure 1. "POP" Suppression Circuit

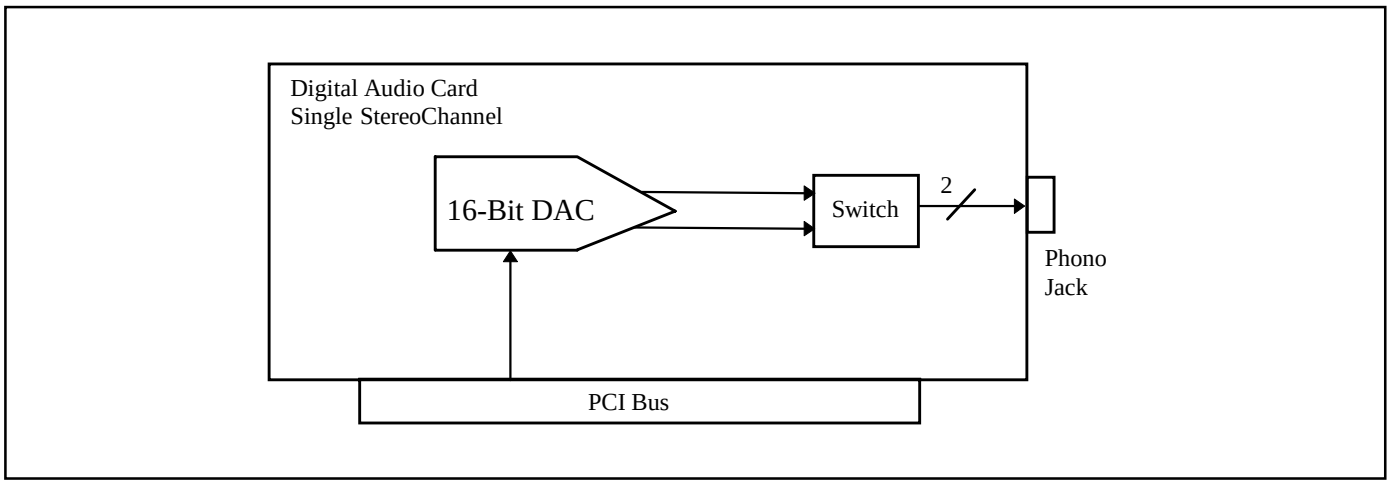

Figure 2. Simplified Digital Audio Card

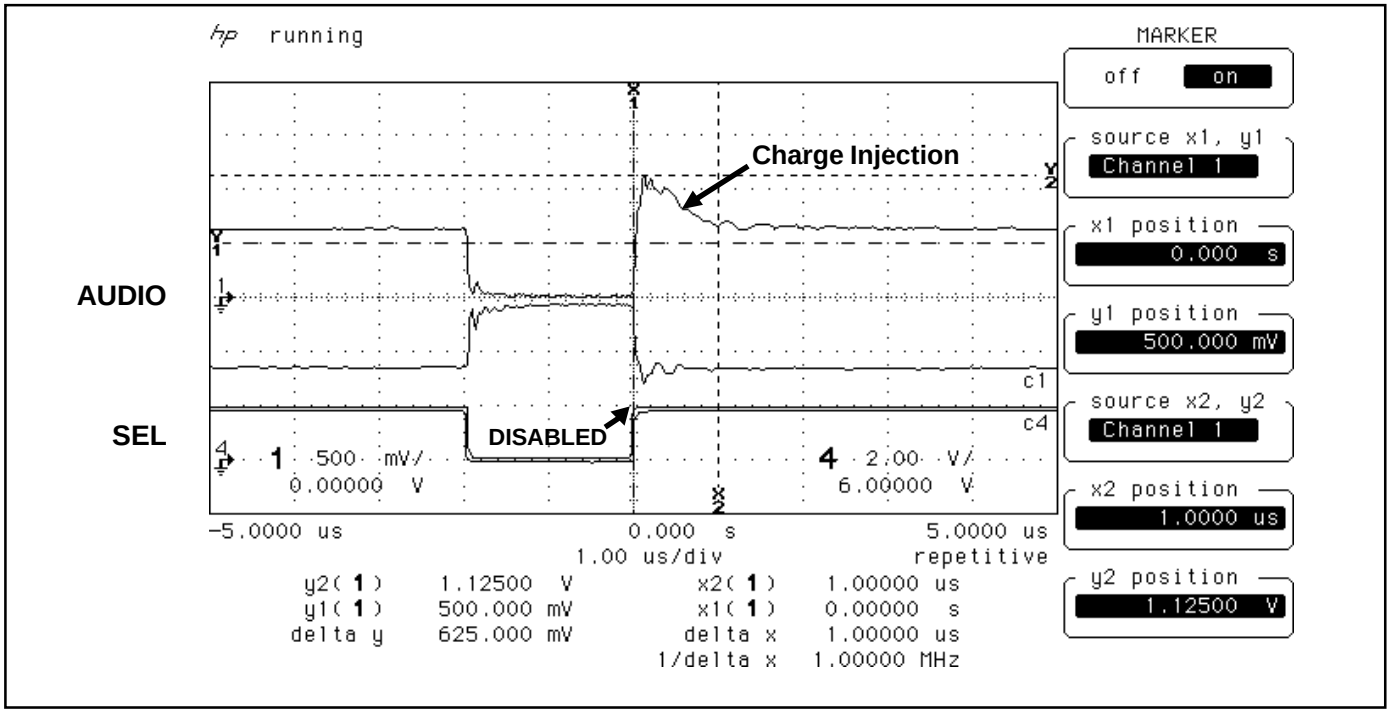

Figure 3. Charge Injection – Noise Injected into Speaker