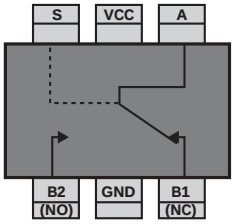
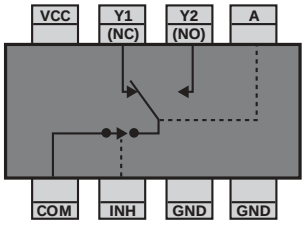
SN74LVC1G3157 and SN74LVC2G53 SPDT Analog Switches

Overview of SPDT Analog Switches

Texas Instruments (TI) broadens its signal switch portfolio with the SN74LVC1G3157 and SN74LVC2G53 devices. The main difference between these devices is both channels on the LVC2G53 can be placed into high impedance providing further flexibility. These 2:1 Multiplexer/Demultiplexer Analog Switches are better known as Single-Pole/Double-Throw (SPDT) switches in the analog realm. Designed for 1.65-V to 5.5-V V_{CC} operation, these devices can handle both analog and digital signals and permit signals with amplitudes of up to V_{CC} (peak) to be transmitted in either direction without clipping. Applications include analog signal routing, signal gating, chopping and digital signal multiplexing/demultiplexing.





LVC1G3157	
Control Input	On Channel
S	
L	B1
H	B2

LVC2G53		
Control Input		On
INH	A	Channel
L	L	Y1
L	H	Y2
H	X	None

Pb-FREE

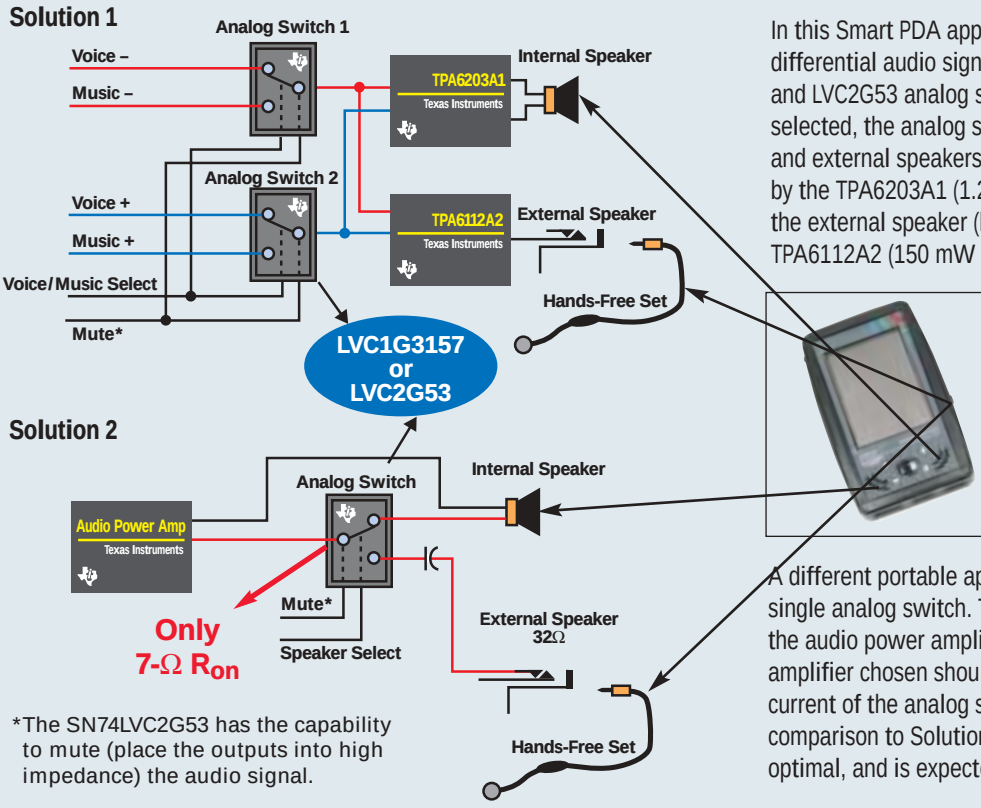
Also Available in Pb-FREE NanoFree.

The devices are available in industry standard 6-pin [SC-70 (DCK) and SOT-23 (DBV)] and 8-pin (SSOP, VSSOP and NanoStar™) packages, making them extremely well suited for space-constrained, portable applications such as PDAs, cell phones and other handheld products.

SPDT Analog Switches Add Flexibility to Your Design

This application clip focuses on several key applications where these devices bring added functionality to your design. The applications include analog audio signal routing, power-up monitoring and memory sharing.

Analog Audio Routing



*The SN74LVC2G53 has the capability to mute (place the outputs into high impedance) the audio signal.

In this Smart PDA application the voice and music differential audio signals can be routed using the LVC1G3157 and LVC2G53 analog switches. When either voice or data is selected, the analog signal is transmitted to both internal and external speakers. The internal speaker is being driven by the TPA6203A1 (1.25W mono differential amplifier), while the external speaker (hands-free set) is being driven by the TPA6112A2 (150 mW stereo audio power amplifier).

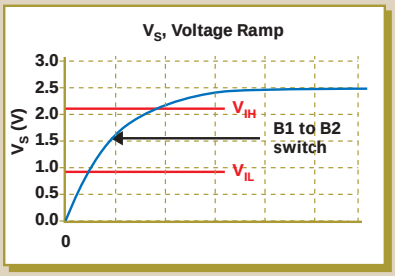
NanoStar™ technology is ideal for handheld equipment where board space is paramount!

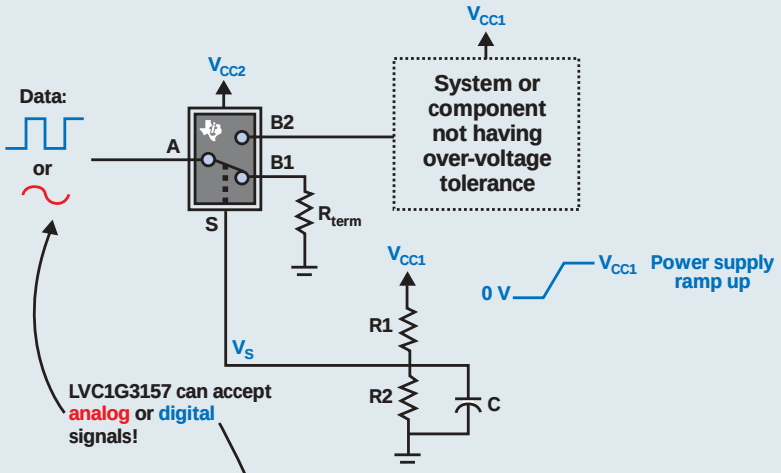
A different portable application is depicted here with a single analog switch. The analog switch is placed between the audio power amplifier and audio hardware. The audio amplifier chosen should not exceed the on-state switch current of the analog switch, which is ±128 mA dc. In comparison to Solution 1, power efficiency will not be as optimal, and is expected from this low-cost solution.

Power Up Monitor

The SN74LVC1G3157 SPDT analog switch is flexible enough for use in a variety of circuits. Using this circuit idea, a system designer can ensure a component or subsystem power has ramped up before allowing signals to be applied to its input. This is useful for integrated circuits that do not have over-voltage tolerant inputs.The basic idea uses a resistor divider on the V_{CC1} power rail, which is ramping up. The RC time constant of the resistor divider further delays the voltage ramp on the select pin of the SPDT bus switch. By carefully selecting values for R1, R2 and C, it is possible to ensure that V_{CC1} will reach its nominal value before the path from A to B2 is established, thus preventing a signal being present on an I/O before the device/system is powered up. To ensure the minimum desired delay is achieved, the designer should calculate the time required from a transition from ground (0V) to half the supply voltage ($V_{CC1}/2$).

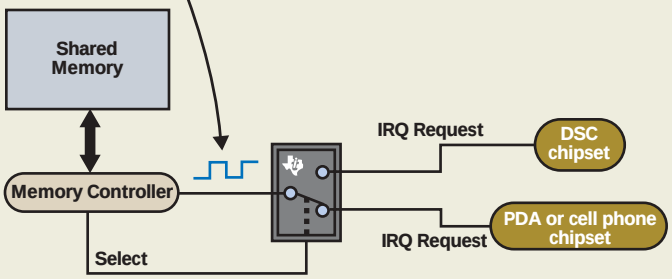
- Set $\left(\frac{R2}{R1 + R2} \times V_{CC1} > V_{IH}\right)$ of the select pin
- Choose Rs and C to achieve the desired delay
- When V_S goes HIGH, the signal will be passed





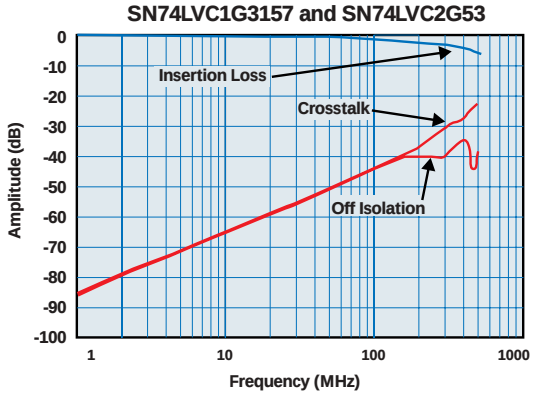
Memory Sharing

As integration becomes more and more prevalent in the consumer space, two or more functionalities are being combined into single end products. An example of this is the convergence of the PDA or cell phone with the digital still camera (DSC). Once the added functionality of the DSC is introduced, the core chipset will need to access available memory shared by the PDA or cell phone chipset and will send control signals (not shown in the application circuit below) to the memory controller requesting access. This simple application summarizes how the digital interrupt request (IRQ) signal can be multiplexed using the SN74LVC1G3157 to implement this functionality.



Performance Characteristics

The performance of the SN74LVC1G3157 and SN74LVC2G53 SPDT analog switches, as shown in the graphic, reveals that for the applications highlighted in this application clip the insertion loss, crosstalk and off isolation characteristics are more than sufficient to achieve superior functionality from your system.



For More Information

Product Folder:
www.ti.com/sc/device/SN7LVC1G3157
www.ti.com/sc/device/SN7LVC2G53
Data Sheet:
www-s.ti.com/sc/techlit/sces424a
www-s.ti.com/sc/techlit/sces3241

Application Report:
www-s.ti.com/sc/techlit/szza030
Analog Switches Home Page:
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