

TECH BRIEF

ESD Protection Audio Input and Output Lines

Background

Electronic systems are sensitive to both external and internal sources of overvoltage transients. This can be in the form of external Electro-Static Discharge (ESD) or internally generated Electrical Fast Transients (EFT). The purpose of this application brief is to detail Audio port protection.

The Problem

Externally generated ESD pulses are introduced through the Audio jacks (headphone, microphone, RCA-type plugs, etc.) and travel through the connector onto the system board. Once on the board, they will propagate down the signal lines toward the integrated circuits (IC). Most ICs are designed with 2,000V of internal ESD protection. It is not uncommon to measure ESD transients in consumer environments over 8,000V. Without sufficient protection, the Audio system can experience visual distortion or corrupted data. In addition, the IC could be permanently damaged rendering the whole system inoperable.

Internally generated EFT pulses are

created by the electronic system.

Sources include switching high current loads (such as the fly back transformer), pump lasers or other harsh environments. The EFT can be introduced via the power supply or inductively coupled onto a signal line. Regardless of the method of introduction, the results may be soft or hard failures similar to ESD failures.

The Solution

In order to provide the IC with protection against ESD and EFT transients, the use of suppression products is recommended. The suppressors are installed between the signal line and the power supply or shield ground (parallel connection) to shunt the transient from the signal line to AC ground.

Examples of products which can benefit from Audio port transient protection:

- Computers (laptop / desk top)
- Stereo system components
- Compact disk and MP3 players
- Video cassette and DVD players
- Video recorders
- Set-top boxes
- Game consoles (Xbox, Playstation)



Circuit Examples

Solution 1

To protect a standard audio port (e.g., RCA-type jack) used in Audio/Video equipment, a single-channel protection device is recommended. A high capacitance 0402 or 0603- size multilayer varistor (MLV) will provide the IC with protection against ESD transients as well as providing EMI filtering to eliminate noise from the circuit. Per Figure 1, the suppressor is installed between the signal line and shield ground (parallel connection) to shunt the transient from the signal line to ground.

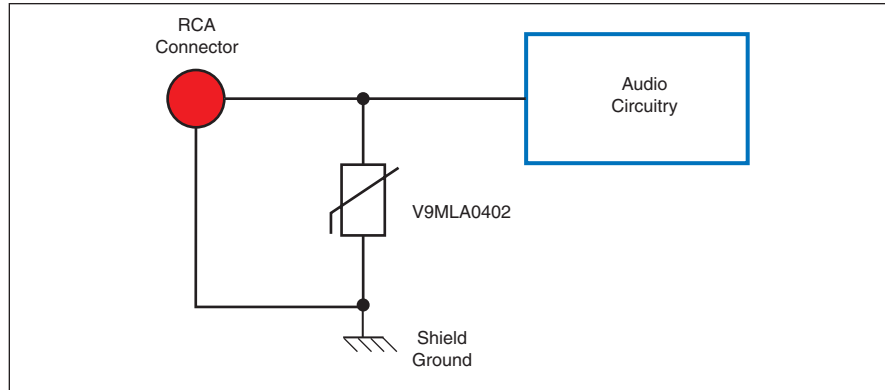


Figure 1. Audio Port Protection

Solution 2

Figure 2 shows an example where the requirement is to protect four ports – Audio in/out, left and right channels. A V18MLN41206 is used to protect all four channels; accomplishing this with the placement of a single component.

- Stereo tuner
- Cable/satellite TV set top box

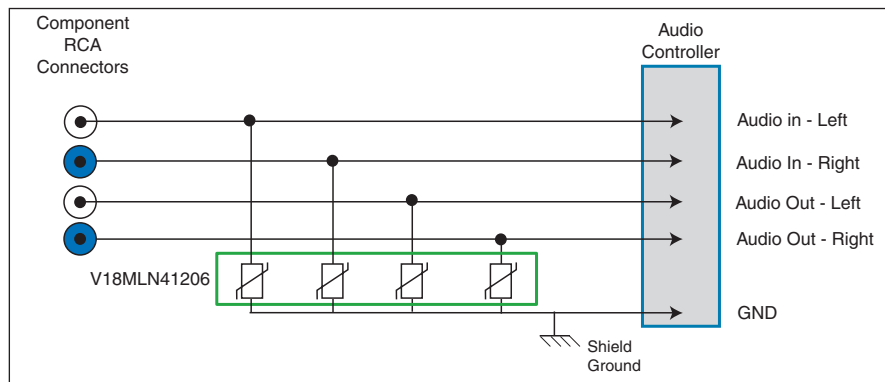


Figure 2. Component Audio Protection

Solution 3

Figure 3 shows the SP0503BAHT providing ESD protection to the headset port of a cell phone. This type of circuitry is increasing in popularity as the hands-free capability becomes more important for the cell phone user. The TVS avalanche diodes direct the over-voltage transient away from the circuitry to the ground bus.

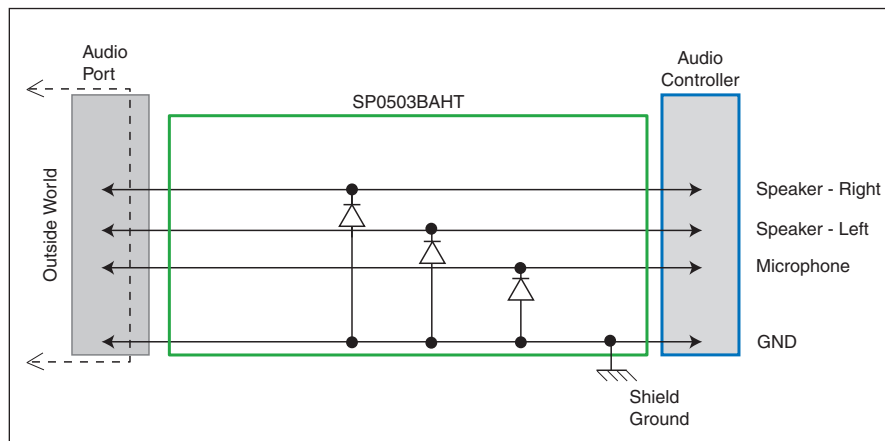


Figure 3. Headset port protection

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